

5. Electronic II

Cost of equipment :

price Thousand Yen : 165,396

price US \$: 848,185



5-1 Semiconductor element testing arrangement

Room No. & name of facilities	Db 203 Workshop Transistor EII		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Iwatsu Electric Semiconductors trainer type ITf-05	60	17	1,020

Specifications:

Contents of training:

- i) Training of characteristic (voltage and current) measurement of 2 terminal elements.

Measurements: diode, zener diode, selenium rectifier, varistor, thyristor, etc.

- ii) Training of characteristic (voltage, current, various parameters) measurement of 3 terminal elements.

Transistor: static characteristic, h parameter (AC overlapping)
 FET: static characteristic, amplitude, impedance
 SCR: static characteristic

Control power source: regulated voltage 5V ~ -10V
 regulated current 10 μ A ~ 10mA

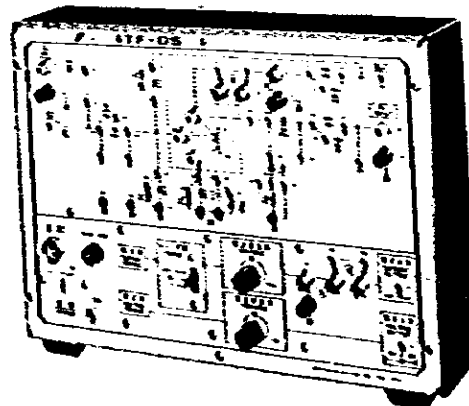
Power source: AC 220V, 60Hz

Remarks:

Can master the operation and characteristic of various semiconductor elements.

Self contained voltage source

Handy and simple type



5-2 Transistor testing arrangement

Room No. & name of facilities	Db 203 Workshop Transistor Ell		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Ando Electric Transistor circuit trainer type TA-13	160	17	2,720

Specifications:

Contents of training:

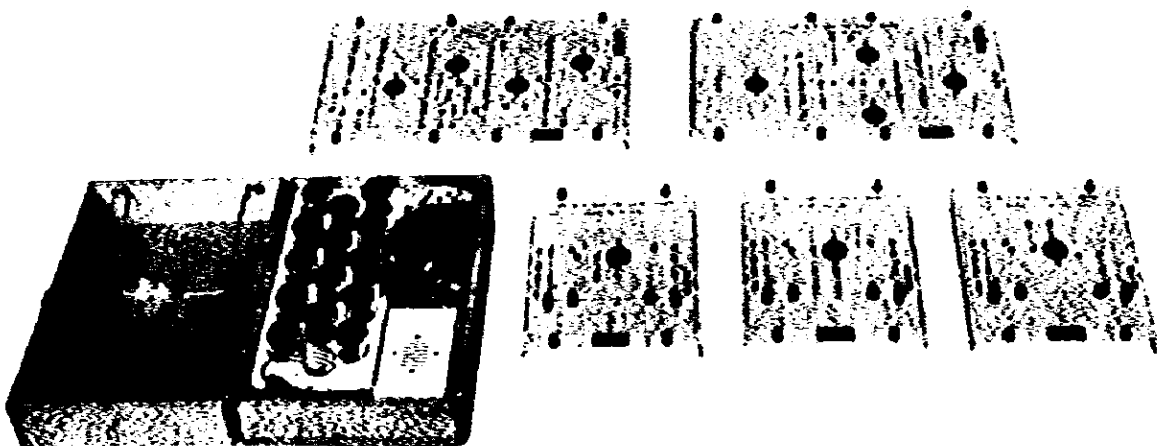
1. Measurement of static characteristics of transistors
2. Demonstration of transistor parameters
3. Study of the circuit constants based on the dynamic characteristics of transistors
4. Determination of constants of a RC-coupled voltage amplifier circuit by common-emitter connection

Self contained voltage source and stabilized power supply

Remarks:

Self contained voltage source

Shall be effective for measurement of various constants, demonstration of static and dynamic characteristics of transistors and FETs.



5-3 Electronic circuit testing arrangement

Room No. & name of facilities	Db 203 Workshop Transistor EII		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Iwatsu Electric Electronic Circuits trainer type ITf-01	280	17	4,760

Specifications:

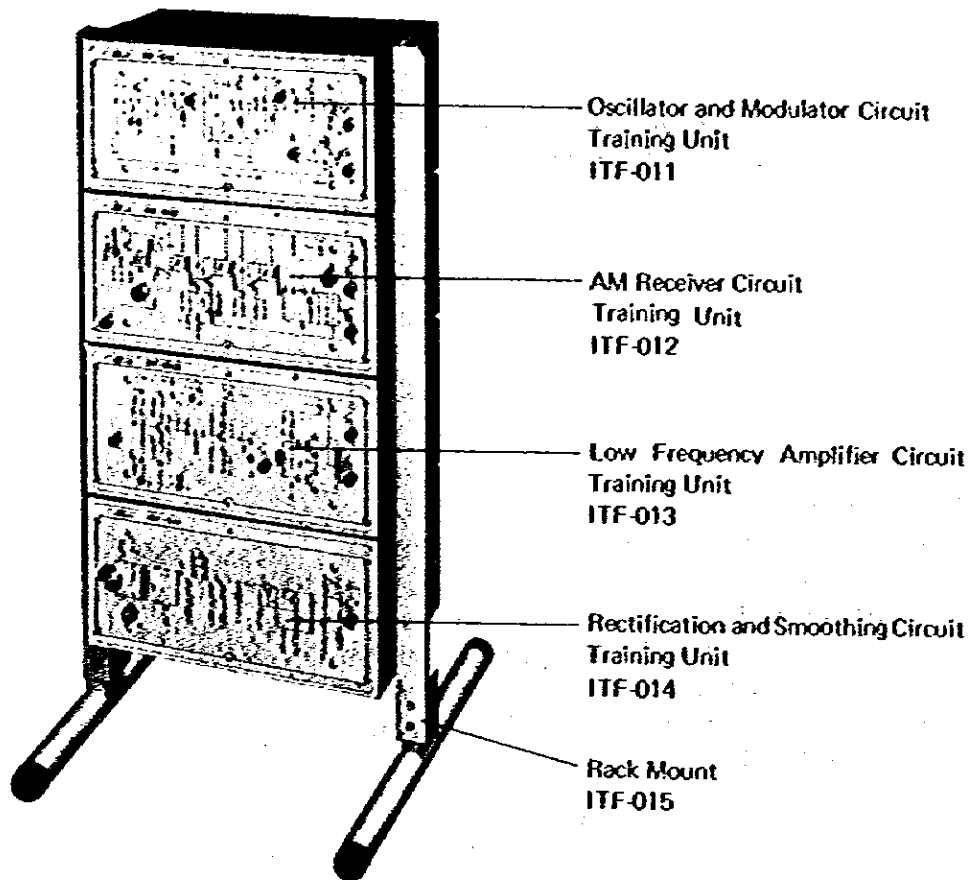
Contents of training:

1. Audio amplifier circuit training unit
 - Training of bias determination, amplitude, frequency characteristic, phase characteristic wide band amplification (training of feedback, peaking and low frequency boost)
 - Training of double amplifier circuit
 - Training of power amplifier circuit (bias, power, efficiency, distortion)
2. Oscillator and modulator circuits training unit
 - Training of collector tuning (bias, frequency and oscillation requirements)
 - Training of CR type phase transient oscillator
 - Training of collector modulating circuit
3. AM receiver circuit training unit
 - Training of IF tuning characteristic
 - Training of bias characteristic at AGC and non-AGC
 - Training of detection characteristic
 - Training of receiver circuit and frequency converter
4. Rectifier and smoothing circuit training unit
 - Training of half wave rectifier circuit and full wave rectifier circuit
 - Training of smoothing circuit (C, LC, π)

Power source: AC 220V, 60Hz

Remarks:

For measurement of radio receiver and amplifier circuits using transistors



5-4 Pulse circuit testing arrangement

Room No. & name of facilities		Db 203 Workshop Transistor EII		
Name of manufacturer & type for reference		Unit price	Q'ty	Amount
Iwatsu Electric	Pulse circuits trainer type ITf-03 (ITf-031, 032, 033)	250	17	4,250

Specifications:

Contents of training:

1. Training of differentiation circuit and integration circuit
2. Training of clipping circuit and clamping circuit
3. Training of logic circuits (AND, OR, NOT)
4. Training of Miller circuit and bootstrap circuit
5. Training of multi-vibrator (mono-stable, astable, bistable, Schmitt trigger)
6. Training of decade counter by four flip-flop circuits
7. Training of step form wave generating circuit

Three-digit decimal counter 1

Frequency range: 10Hz to 10kHz

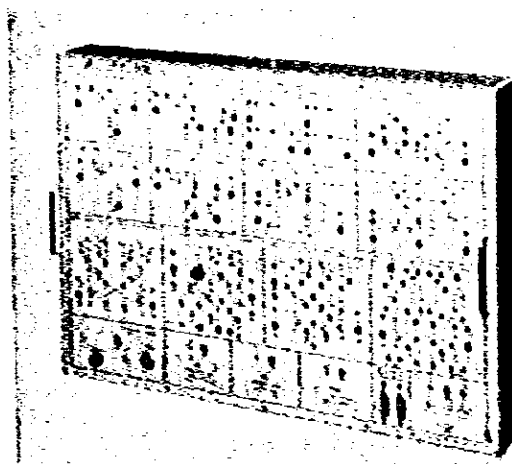
Input voltage: 0.2Vrms - 20Vrms

Self contained voltage source

Power source: AC 220V, 60Hz

Remarks:

The training of the foundation of pulse circuits can easily be performed.



5-5 IC circuit testing arrangement

Room No. & name of facilities	Db 203 Workshop Transistor EII		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Kimura Electric Works	600	12	7,200

Specifications:

This apparatus must be able to perform three roughly divided experiments with individual panels.

i) Logic IC

- Confirmation of threshold level of TTL IC
- Confirmation of the operation of AND, OR, NOR, NAND, EXOR, wired OR of TTL IC
- Assembly of unstable multivibrator and single stable multivibrator of TTL IC.
- Test of flip-flop circuit using TTL NAND, and various flip-flop IC
- Test of TTL counter IC and frequency divider
- Test of TTL shift register (including serial-parallel, parallel-serial shift register)
- Test of TTL memory (SN7489)
- Test of TTL comparator IC
- Test of TTL conversion IC (including BCD-decimal, binary-octal, binary-hexadecimal, and reversed conversions)
- Test of TTL driver (one, segment, etc.)
- Test of TTL multiplication and addition IC
- Test of TTL three state buffer IC

These circuit boards must be of plug-in type for easy experiments. This apparatus must have the stabilized power source.

ii) Analog IC

- a) OP amplifier circuit (709)
 - Inversion amplification circuit test
 - Non-inversion amplification circuit test
 - Differential amplification circuit test
 - Oscillator test
 - Converter circuit test
 - Low-pass filter circuit test
 - High-pass filter circuit test
 - Addition and subtraction circuits test
 - Anti-calculation amplification circuit test

- DC characteristics test
 - Input/output impedance measurement
 - Gain test
 - Frequency response test
 - Transient response characteristics
- } By the above test method

This OP amplifier must be assembled on one circuit board for the practice by students. This OP amplifier must be plugged in the above power source.

b) Voltage regulator IC

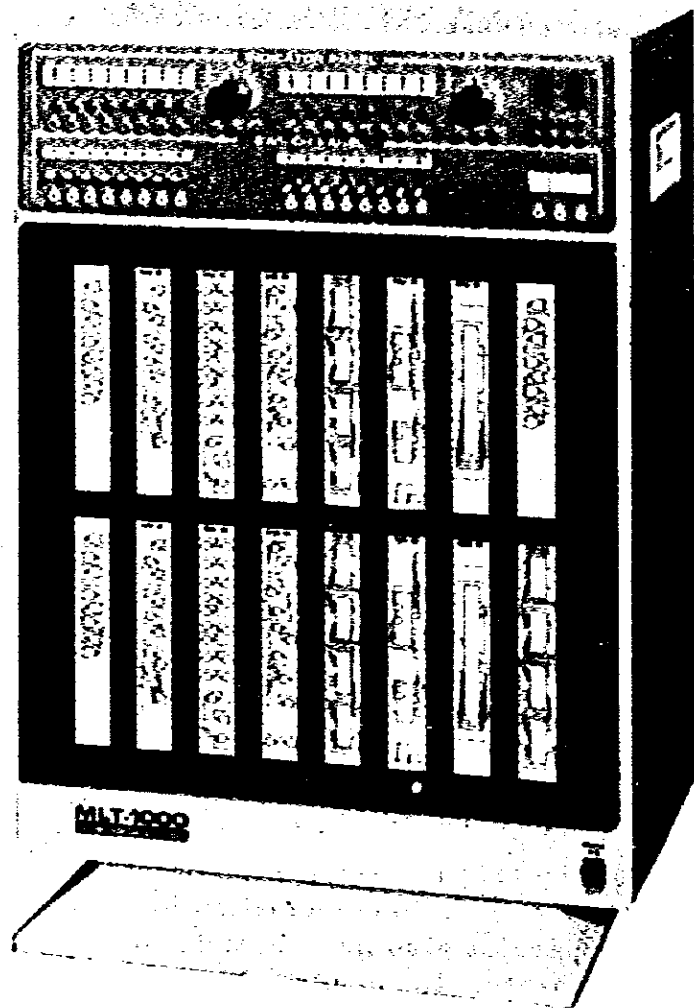
- Input fluctuation vs output fluctuation test
- Load fluctuation vs output fluctuation test
- Temperature characteristics measurement
- Noise voltage measurement
- Transient response measurement
- Stability measurement
- Drift measurement
- These items should be measured by three-terminal regulator, 723 type, etc.

The power source must be separated for the practice.

These sixteen experimental circuit boards and the power source must be accommodated in one box.

Remarks:

This apparatus must be able to perform the practice of the basic circuit by connecting single elements in combination by means of IC panel using TTL. This apparatus also must be able to make extended experiment by incorporating the printed circuit board in a socket. It also must have a stabilized built-in power source.



5-6 Acoustic equipment testing arrangement

Room No. & name of facilities	Db 203 Workshop Transistor EII			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount	
Ando Electric Acoustic Technique trainer type ASA-13	350	6	2,100	

Specifications:

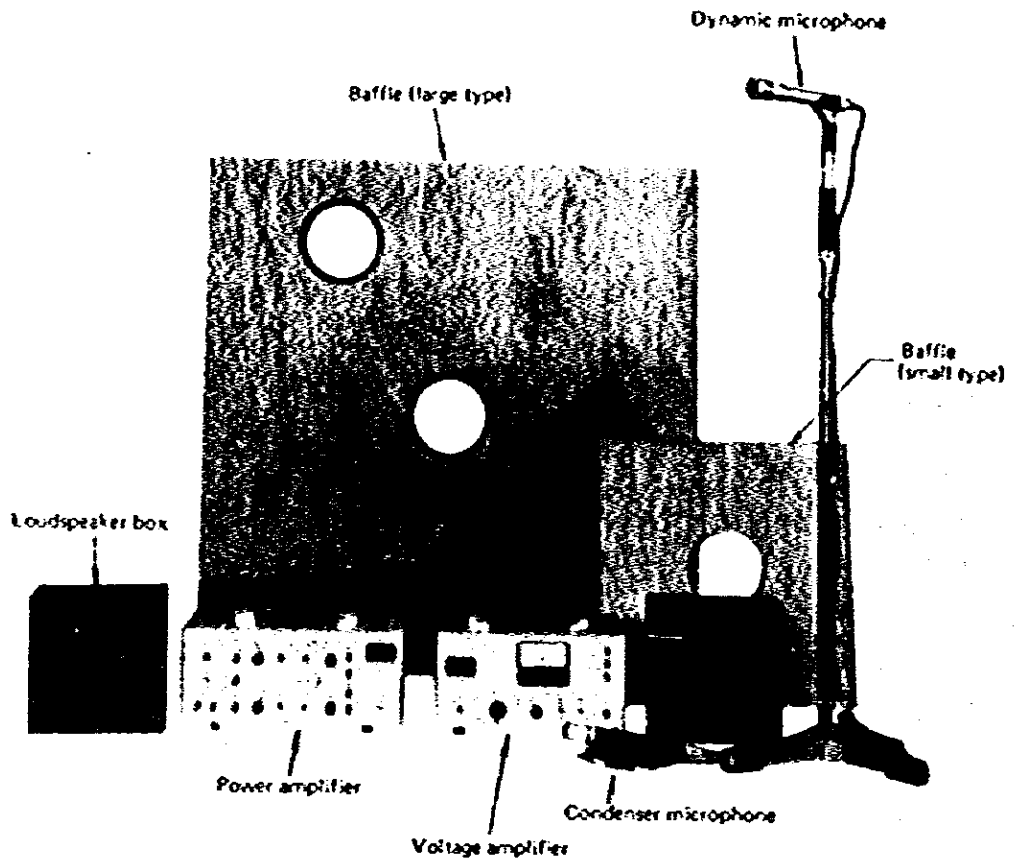
Training schedule:

1. Comparison of the construction and directivity between a dynamic microphone and a condenser microphone
2. Measurement of frequency characteristics of speakers
3. Study of the relation between the band width of the reproduced frequency and the tone quality, tone color and articulation
4. Study of the effects of baffles and cabinets
5. Elucidation of the cause of the stereophonic effect

Power source: AC220V, 60Hz

Remarks:

Measurement of frequency characteristics of speakers and study of the effects of baffles and cabinets can be easily performed.



5-7 Sound-recorder testing arrangement

Room No. & name of facilities	Db 203 Workshop Transistor EII		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Leader Wow and flutter meter type LFM-38	1,200	6	7,200

Specifications:

- o Tape speed (speed diviation, speed fluctuation range) measurement
- o Tape speed drift measurement
- o Wow and flutter measurement
 - Tape winding-up and pulling-out force measurement
 - Tape feed starting characteristic measurement
- o Frequency response (playback) measurement by test tape
- o Playback system S/N ratio measurement
 - Playback system linearity measurement
 - Recording amplifier linearity measurement
 - Distortion factor measurement (playback and recording)
- o Total frequency response measurement
 - Total S/N ratio measurement
- o Channel separation measurement
- o Erasure efficiency measurement
 - Transcription factor measurement
- o Bias characteristics measurement
 - Equalizer amplifier characteristics (variable) measurement
 - Head height, flapping angle and inclination angle for running tape must be adjustable.

Installed on the practice desk.

Remarks:

This apparatus must be able to test the mechanism of commercial tape recorders and to measure their electrical characteristics.

It must be able to set so as to measure the items above marked o.

5-8 Stereophonic amplifier testing arrangement

Room No. & name of facilities		Db 203 Workshop Transistor EII		
Name of manufacturer & type for reference		Unit price	Q'ty	Amount
Leader	Audio tester type LAV-190	100	6	600
	Distortion factor meter type LDM-170	100	6	600
		(total)		1,200

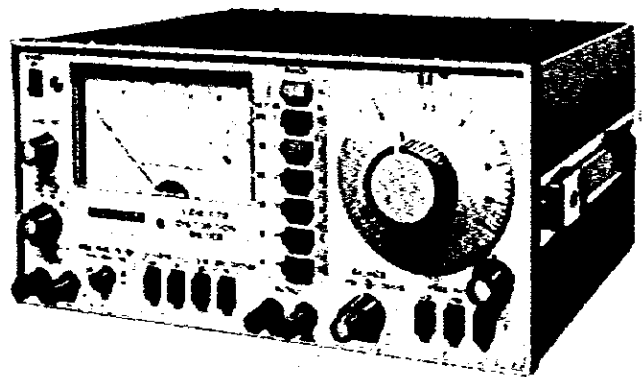
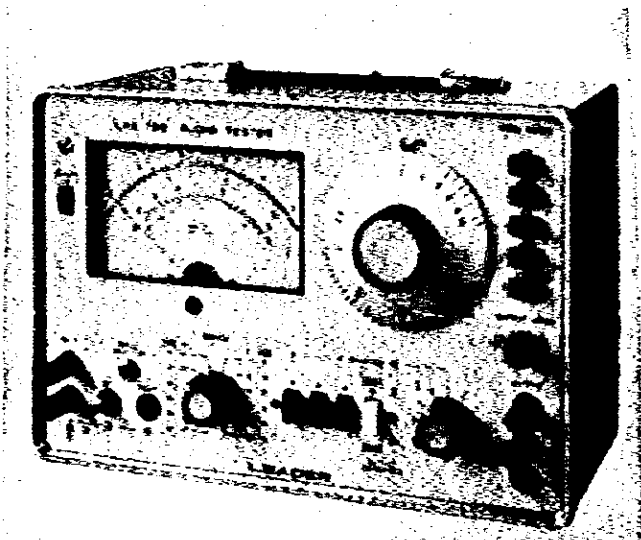
Specifications:

Exploded stereo pre and main amplifier (effective output: more than 30W + 30W)

Switching to RIAA equalizer (plug-in type): possible
Each measuring terminal must be specially devised.
Can measure the following items:

- Input sensitivity measurement
- S/N ratio measurement
- Input impedance measurement
- Frequency response measurement
- Output measurement
- Transient characteristics measurement
- Measurement of influences of the fluctuation of power source voltage on various characteristics
- Distortion factor measurement

All the switches including a changeover switch must be installed on the panel.



5-9 Automatic exchange testing arrangement

Room No. & name of facilities	Db 206 Workshop Basicwire Tel EII			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount	
Iwatsu Electric Type IPAC-40	800	1	800	

Specifications:

Automatic exchanger: cross-bar system

Number of circuits: more than 6

Mutual connection: possible

Exploded type for instruction

Telephone: dial telephone (more than 6)

push-button telephone (more than 6)

Power source: 1

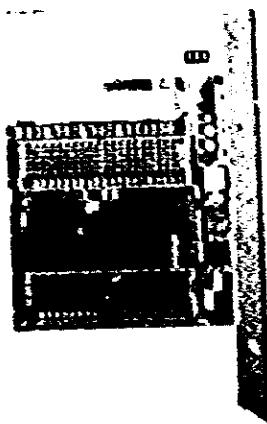
A sample set for explanation shall be attached, which can be easily maintained and show the internal operation clearly.

It can perform model operation (one circuit operation, etc.), and measure the basic characteristics of relays.

Remarks:

For demonstrating the principle of automatic exchanger for easy understanding.

Easy maintenance



5-10 Teleprinter arrangement

Room No. & name of facilities	Db 206 Workshop Basicwire Tel EII		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	500	1	500

Specifications:

Type-printing telegraph practice apparatus

System: transmission and reception common system

Typewriter: available

Relay system: tape relay system

Cable connection: possible

With a relay device and arranged for easy understanding of the basic principle

Accessories:

Tape 20 turns

Remarks:

For demonstrating the mechanism of the transmission and reception by a teletype.

5-11 Carrier telephone arrangement

Room No. & name of facilities	Db 206 Workshop Basicwire Tel EII		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	1,500	1	1,500

Specifications:

Carrier-current telephone practice apparatus:

- System: more than two channel mutual communication system
- Exploded type for instruction
- Telephone 4 sets
- With measurement terminal:
- Waveform observation: possible
- With connector
- With Power source

Remarks:

Each part shall be arranged for easy understanding of the principle such as waveform observation.

5-12 Remote measurement arrangement

Room No. & name of facilities		Db 206 Workshop Basicwire Tel EII		
Name of manufacturer & type for reference		Unit price	Q'ty	Amount
Yokogawa Electric Works	Power line transducers (3-phase, 3-wire)			
	- AC voltage transducer type 227115	27		
	- Watt transducer type 227221	60	1 set	187
	- Frequency transducer type 227513	35		
	- Power factor transducer type 227602	65		

Specifications:

AC voltage, Watt, Frequency and Power factor transducers one for each

Transmission system: Cable system

Wireless system: terminals are required for switching over both systems.

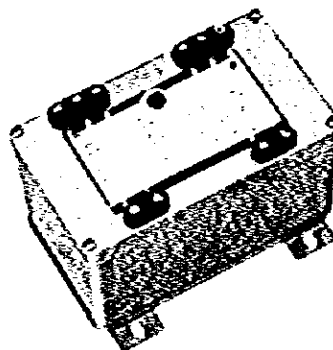
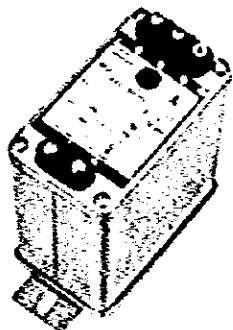
Indication system: both recording system and meter indication system
the indication meter shall be installed on a panel.

Remarks:

3-phase and 3-wire AC voltage, Watt, Frequency and Power factor DC-converters

Meter indicating system on a experimental table

Attached with a recorder



5-13 Experimental antenna arrangement

Room No. & name of facilities	Db 208 Workshop Basic Wireless Tel EIB			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount	
Anritsu Electric Field strength meter type ML56A/B	250	1	250	

Specifications:

Oscillator: simple type, 600MHz band with modulation, external modulation: possible

Doublet antenna: with tripod and cable

Yagi antenna: - ditto -

CM directional coupler

Field strength meter:

Frequency: 500 to 900MHz

Input impedance: 50Ω, connector: N female

Voltage measuring range: Min.: ≤15dB

Max.: (Min. value + 100) dB

Bandwidth (6 dB): 80kHz

Image ratio: ≥40dB

IF output: 1MHz, 77dB

Monitor: A2, A3 and F3 monitoring are provided

Power source: DC 12V, ≤130mA, or AC 220V, 60Hz, ≤6VA

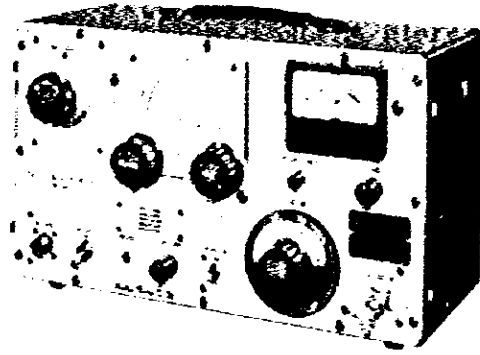
SUM-1 × 8 dry batteries, Capable of external battery operation

Accessories:

1. AC power pack: 220V, 60Hz, ≤6 VA (plugged into the ML56)
2. Quasi-peak meters: for quasi-peak detection measurements ... 2

Remarks:

For measuring gain, pattern, etc. by the combination of standard antenna and field strength meter.



5-14 Experimental microwave arrangement

Room No. & name of facilities	Db 208 Workshop Basic Wireless Tel EII		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Ando Electric Microwave technique trainers	1,000	1	1,000

Specifications:

9000MHz band microwave practice apparatus:

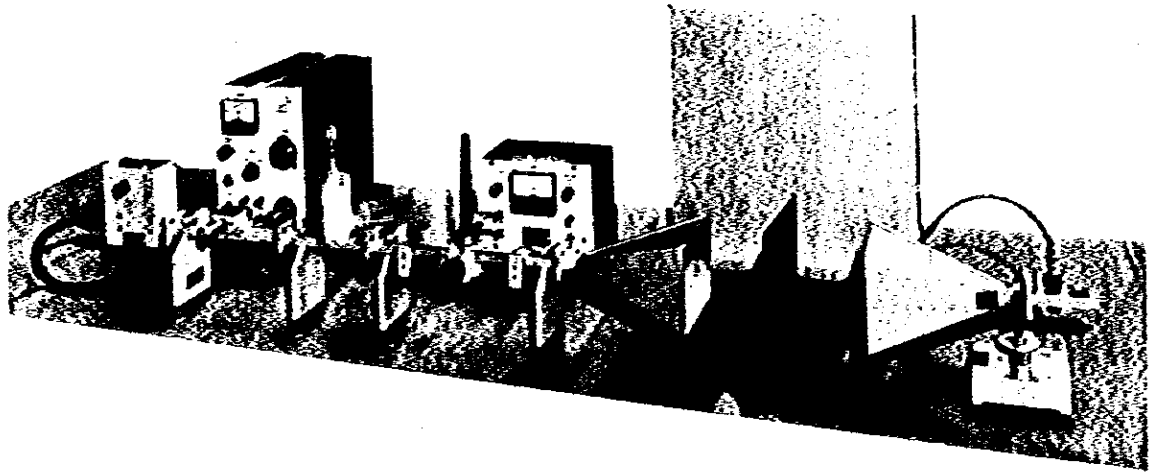
- Oscillator 1
- Attenuator 2
- Standing wave measuring instrument 1
- Matching device 2
- Electromagnetic horn 2
- Receiver 1
- Waveguide: 5 with 20 flanges of 1 m in length
- Frequency meter: hallow barrel type with meter 1
- Pattern scope 1
- Directivity combiner 1
- Power source 1
- Wattmeter 1

Accessories:

- 1. Metallic screen 1
- 2. Paraffin prism 1
- 3. Metallic reflector 2
- 4. Metallic interference plate 2

Remarks:

Can measure standing wave and matching.
 For demonstration of the principle of transmitter and receiver.



5-15 Feeder standing wave measuring arrangement

Room No. & name of facilities	Db 208 Workshop Basic Wireless Tel EII		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	200	1	200

Specifications:

For measuring the standing wave by short-circuit and opening of the feeder.

Wavelength: about 1m

Oscillator: 10W

Detector

Impedance meter

Can perform the practice in connection with antenna.

Remarks:

For measuring the standing wave and impedance by the change of the load of parallel line.

For demonstrating the feeder standing wave.

5-16 Radio transmitter/receiver

Room No. & name of facilities		Db 208 Workshop Basic Wireless Tel EII		
Name of manufacturer & type for reference		Unit price	Q'ty	Amount
TORIO	Type R-599S	150	2	400
	Type R-300	50		

Specifications:

AM transmitter for practice:

Frequency: 1MHz band, and 3 or more amateur bands

Output: 10W

AM modulation: possible by using a microphone

With load resistor

Feeder: parallel feeder, can observe standing wave

With cassette recorder

Receiver: for all-band, 170kHz - 30MHz or above

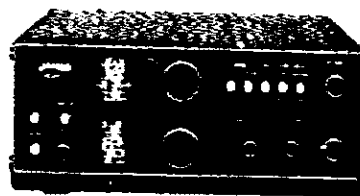
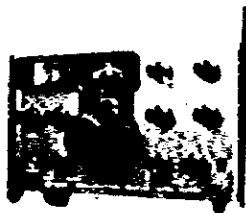
Electric waveform: AM, CW, SSB

Low-frequency output: more than 1W

Remarks:

Radio transmitter can transmit several kinds of spot waveforms.

Can be used for amateur radio station.



5-17 FM transmitter/receiver

Room No. & name of facilities	Db 208 Workshop Basic Wireless Tel EI		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	200	2	400

Specifications:

FM transmitter for practice:

Frequency: standard band, 50MHz - 100MHz

Output: 5W

With load resistor

FM modulation: possible by using a microphone

With cassette recorder

The signals transmitted by FM transmitter can be used to adjust FM receiver.

For the practice of stereo transmission and reception.

Remarks:

FM transmitter for testing FM receiver can be used in a laboratory.

Stereo modulation: possible

Handy type

5-18 Experimental logic circuit arrangement

Room No. & name of facilities	Db 203 Workshop Transistor EII		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
IWATSU Logic circuits trainer type ITF-02	400	2	800

Specifications:

Contents of training:

- Basic operation training of AND, OR, NOT, NAND, NOR and Exclusive OR.
- Assembly and operation training of half-adder and full-adder
- Assembly and operation training of encoder and decoder
- Basic operation training of R-S and J-K flip flops
- Basic operation training of shift registers, other application training

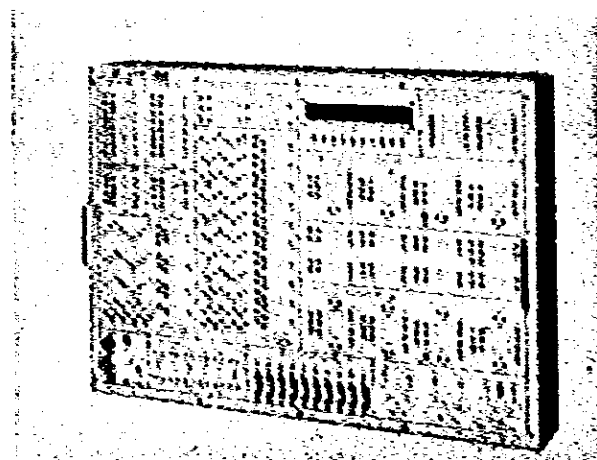
With stabilized power source

Power source: AC 220V, 60Hz

Remarks:

Since input/output terminal is attached to each circuit elements, the connection between circuit elements is possible and various combinations can be made.

Since the number of circuit elements is many (45 gates, 10 flip-flops), application is made sufficiently.



5-19 Experimental laser arrangement

Room No. & name of facilities	Db 208 Workshop Basic Wireless Tel EII			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount	
Shimazu Scientific Instrument	110	1	110	
Laser complete apparatus type GLG-2044				
Laser optical bench type LD-44	17	1	17	
	(total)		127	

Specifications:

Generated wave length: $6328 \overset{\circ}{\text{A}}$ (red)
 Stability of the wave length: about 3×10^{-5}
 Output of generation: more than 1.0mW
 Mode of generation: single transverse pattern
 Beam diameter: about 1.2mm
 External modulation terminal is attached.

Can be used for a long period of time.

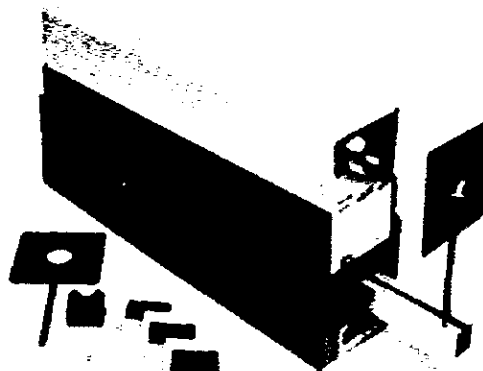
Light modulation circuit and receiving circuit are built-in in order to carry out simple experiments on light communication.

Light glass cable: 10m
 Input/output converters 2 for each
 Laser optical bench 1 set

Remarks:

Can be used for senior high school science education to study basic operation of laser apparatus.

Can per form simple transmission and reception.



5-20 Stabilized power unit

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	50	32	1,600

Specifications:

Same as No. 3-46

5-21 Current regulator

Room No. & name of facilities	Db 203 Workshop Transistor EII		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Taiyo Electric Thyristor inverter experimental equipment type THI-1	500	8	4,000

Specifications:

Thyristor current controlling equipment: 115V (95 - 130V), 5A

Loading equipment

Power source: AC single phase

AC → DC converting part:

Circuit system: mixed bridge LC smoothing circuit

Output voltage: 50V - 150V or more

Rated current: 5A or more

DC → AC inverter part:

Circuit system: Macmurray-Bedford circuit

AC output: 50V - 130V (effective value) or more

Frequency: 20Hz - 70Hz or more

Rated current: 2A (effective value) or more

Maximum inverted current: 10A (at maximum voltage)

Gate pulse: continuous pulse system

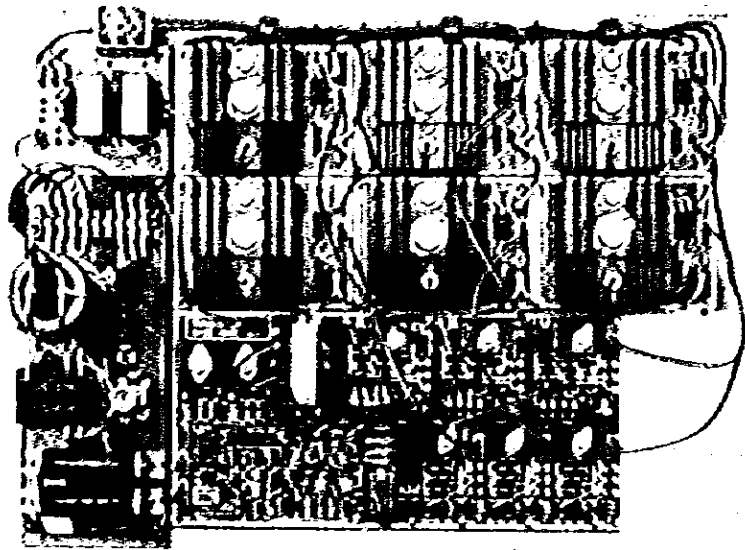
Power source: AC 220V, 60Hz

With measuring terminals, spare diode, thyristor UJT attached.

Remarks:

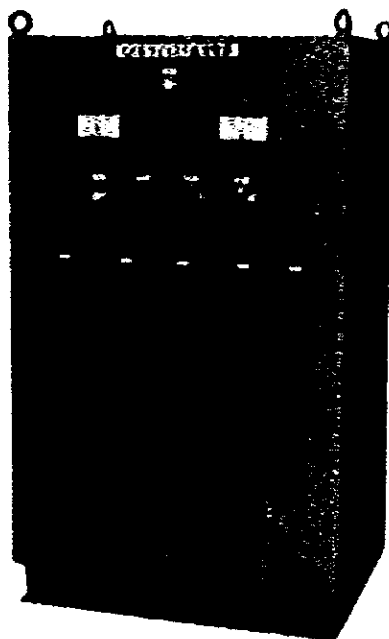
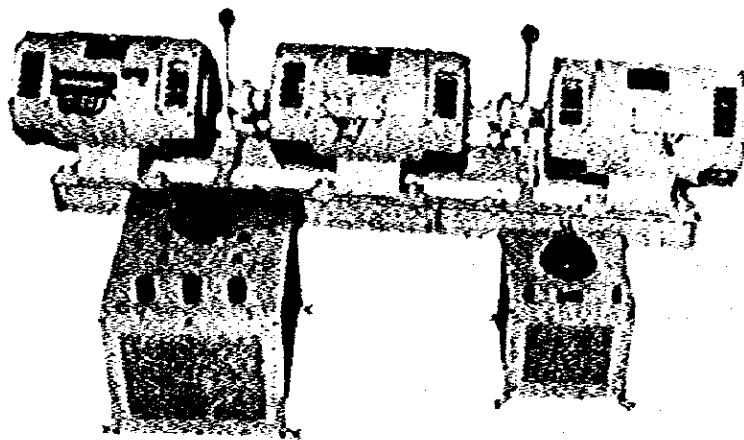
Simple control of thyristor current and facility of wave form observation.

Should have controlling capacity to meet the change in load.



Remarks:

(M) and (G) displays on an operating panel 180 cm wide and 2 m high with terminals, load indicating lamp, alteration switch and other instruments. Recording desk to be attached, and tools and wirings can be stored.



5-22-2 Synchroscope

Room No. & name of facilities	Db 202 Workshop Elec, Machin. EII		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Yokogawa Electric Works Type 2109	35	2	70

Specifications:

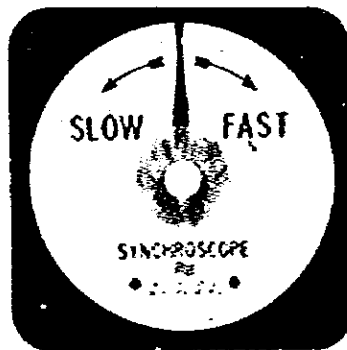
Voltage rating: 220V

Approx. volt-ampere loss:

Starter: 3.7VA

Rotor: 4.5VA

For 3-phase voltage balanced circuit



5-22-3 Phase rotation meter

Room No. & name of facilities	Db 202 Workshop Elec. Machin. EII			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount	
Nihon Keisokuki Type NPR	10	2	20	

Specifications:

3 phase

Usable Voltage range: 50 - 500V or more

Usable frequency range: 20 - 60Hz or more

5-22-4 3-phase induction voltage regulator

Room No. & name of facilities	Db 202 Workshop Elec. Machin. EII			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount	
Iizuka Electric	300	5	1,500	

Specifications:

3 phase

Usable frequency range: 50 - 60Hz

Primary voltage: 200V

Secondary voltage: 200_±200V, 14.4A

Capacity: 5kVA

5-23 Exploded demonstration TV set

Room No. & name of facilities	Db 203 Workshop Transistor		EII
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Kimura Electric Works	100	2	200

Specifications:

Monochromatic exploded television set

small and handy type, with casters

Each circuit shall be arranged in blocks for easy understanding.

Cathode ray tube: 14-inch

Measurement terminals shall be installed for each circuit.

Remarks:

Designed for easy understanding of the principle of monochromatic television.



5-24 Exploded demonstration colour TV set

Room No. & name of facilities	Db 203 Workshop Transistor EII		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Victor	600	2	1,200

Specifications:

Exploded colour TV receiver with a caster.

Each circuit shall be displayed clearly.

Colour TV system: specified in situ. (PAL/SECAM system)

14-inch colour cathode ray tube

Each circuit shall be assembled separately and have measuring terminals.

Can reproduce signals of teaching materials center and VTR unit.

Power source: AC 220V, 60Hz

Remarks:

For understanding SECAM colour TV system.

Can observe the wave form of each terminal of colour circuits.



5-25 DC ammeter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	20	120	2,400

Specifications:

Same as No. 4-22 (JIS C 1102 0.5 class)

Range:

- 20/100 (mA) 30 sets
- 100/500 (mA) 30
- 0.2/1 (A) 30
- 1/5 (A) 15
- 5/25 (A) 15

5-26 DC voltmeter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	20	120	2,400

Specifications:

Same as No. 4-23

Range:

0.3/1/3/10 (V) 50 sets
 3/10/30/100 (V) 50
 30/100/300/1,000 (V) 20

Remarks:

JIS C 1102 0.5 class portable DC voltmeter

5-27 AC ammeter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	16	32	512

Specifications:

Same as No. 4-24

Range:

0.2/1 (A) 12 sets
 100/500 (mA) 10
 20/100 (mA) 10

Remarks:

JIS C 1102 0.5 class portable AC ammeter

5-28 AC voltmeter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	16	32	512

Specifications:

Same as No. 4-25

Range:

- 15/30 (V) 10 sets
- 30/75 (V) 10
- 75/150 (V) 12

Remarks:

JIS C 1102 0.5 class portable AC voltmeter

5-29 High-frequency ammeter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Yokogawa Electric Works type 2016	30	32	960

Specifications:

Range switching is made by connecting the vacuum thermoelement.

Class: JIS C 1102 1.0 class

Scale length: 130mm

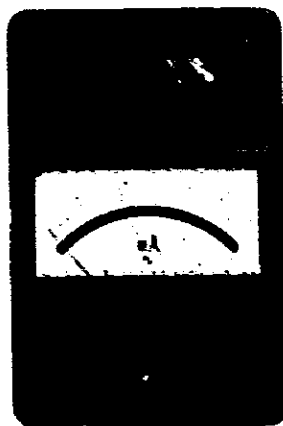
Frequency range: 10Hz - 3MHz

Range:

- 5/10/20/50 mA 12 sets
- 20/50/100/200 mA 10
- 100/200/500/1,000 mA 10

Remarks:

Measurement range: DC to several MHz



5-30 Electronic volt & ohm meter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	30	32	960

Specifications:

Same as No. 3-22

5-31 Electronic voltmeter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	100	32	3,200

Specifications:

Same as No. 4-27

5-32 Circuit tester

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	20	32	640

Specifications:

Same as No. 3-21

5-33 Digital voltmeter

Room No. & name of facilities			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Iwatsu Electric Digital tester type VOAC 727	250	8	2,000

Specifications:

Measurement range:

AC, V AC, A DC, V DC, A

Maximum display: 19,999

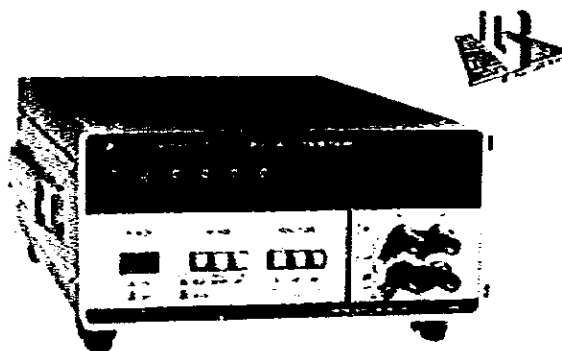
Range switching: automatic, external control

Resolution: $10\mu\text{V}$, $10\text{m}\Omega$, $0.1\mu\text{A}$

Frequency range: 30Hz - 100kHz

With data output terminals

Power source: AC 220V, 60Hz



5-34 Phase meter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	90	12	1,080

Specifications:

Same as No. 4-30

5-35 Resistor

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	70	64	4,480

Specifications:

Same as No. 3-30

5-36 Resistor

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	30	64	1,920

Specifications:

Same as No. 3-29

5-37 Resistance attenuator

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Ando Electric Decade attenuator type AL-253	50	8	400

Specifications:

Frequency range: DC - 150kHz

Attenuation range: 0 - 91 dB

Attenuation steps: 1 db x 20 + 20 dB x 4

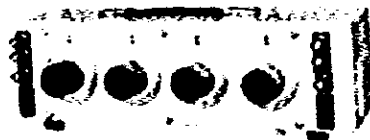
Accuracy: within $\pm 1\%$ dB

Characteristic impedance: 600 Ω , balanced with a center tap

Power source: AC 220V, 60Hz

Remarks:

Small and handy type audio resistance attenuator



5-38 Standard inductance

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	65	12	780

Specifications:

Same as No. 4-53

5-39 Standard capacitor

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	30	12	360

Specifications:

Same as No. 4-54

5-40 Filter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
(1) Ando Electric Variable filters type LF-11, 12, 13, 14 HF-11, 12	200	18	3,600

Specifications:

Variable low pass filters (Characteristic impedance: 600Ω balanced)

Cut-off frequency:

42-60-85-120-170-250 Hz 4 sets

0.35-0.5-0.7-1.0-1.5-2.1-3.0-4.2-

6.0-8.5 kHz 4

4.2-6-8.5-12-17-25-35-50-70-100 kHz 4

Variable low pass filter (Characteristic impedance: 75Ω balanced)

Cut-off frequency:

15-21-30-42-60-84-120-170-240-340-480-680 kHz 3 sets

Variable high pass filters (characteristic impedance: 600Ω balanced)

Cut-off frequency:

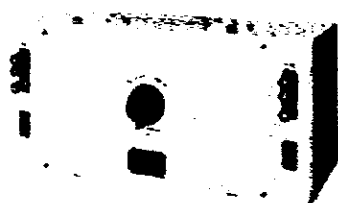
0.15-0.25-0.4-0.6-1-1.5-2.5-4 kHz 1 set

4-6-9-13-20-30-45-68 kHz 1

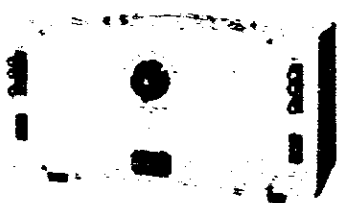
Variable high pass filter (characteristic impedance: 75Ω balanced)

Cut-off frequency:

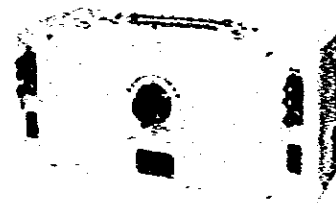
10.7-15-21-30-42-60-84-120-170-240-340-480 kHz 1



TYPE LF-11



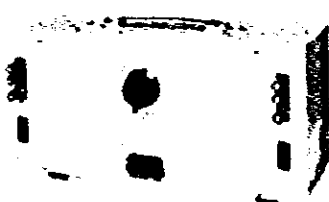
TYPE LF-12



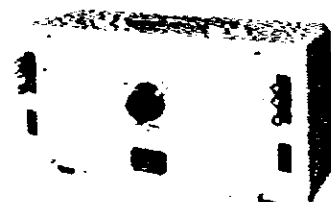
TYPE LF-13



TYPE LF-14



TYPE HF-11



TYPE HF-12

5-41 Megger

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	20	4	80

Specifications:

Same as No. 3-26

5-42 Oscilloscope

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Iwatsu Electric Synchroscope type SS-5112	150	17	2,550

Specifications:

Dual-trace oscilloscope

Cathode ray tube: 5-inch

Vertical deflection system

Frequency range: 0 - 10MHz

Horizontal deflection system

Trigger system: triggered, free-running, single

Sweep mode: normal sweep, external sweep

Power source:

Voltage range: AC 220V ± 10%, 50 - 400Hz

Accessories:

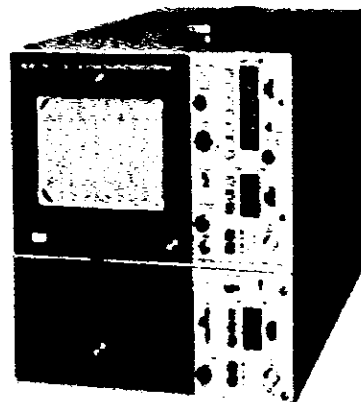
Probe 2

Spare fuses 2

Small and handy type

Remarks:

Dual-trace synchroscope for observation



5-43 Oscilloscope

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	200	32	6,400

Specifications:

Same as No. 4-15

5-44 Oscilloscope

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	620	1	620

Specifications:

Same as No. 4-62

5-45 X-Y recorder

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	550	17	9,350

Specifications:

Same as No. 4-63

5-46 Level meter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Shibasoku Automatic Distortion meter type 900	300	12	3,600

Specifications:

Distortion measurement:

Range: 0.005 - 10%

Frequency range: 20Hz - 20kHz

Input impedance: 100kΩ , 100pF or less

Input level: 0.3 - 30V

Ratio circuit control range: more than 10dB

Harmonic characteristics: ±0.3 dB - from second to fifth

Accuracy: ± 5% of full scale

Level measurement:

Range: 0 - 30V

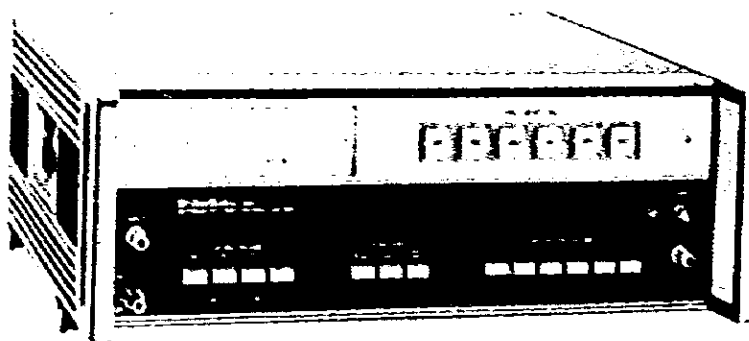
Frequency response: within 0.3dB 10Hz - 100kHz

DC output: 1V in full scale

Power source: AC 220V, 60Hz

Remarks:

Can be used for both distortion measurement and level measurement.



5-47 Output meter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
	50	5	250

Specifications:

Output meter for speech frequency amplifier

**Load impedance: 2, 4, 6, 8, 12, 600 (Ω)
continuously adjustable: possible**

Output: 0 - 100W or above

Remarks:

Can measure the output of each impedance.

5-48 Absorption type frequency meter

Room No. & name of facilities		—		
Name of manufacturer & type for reference		Unit price	Q'ty	Amount
Mita Musen	Grid dip meter type			
	WB-200	50	17	850
	SP-3	100	17	1,700
		(total)		2,550

Specifications:

Frequency range: 0.4 - 200MHz
 plug-in type coils

Self contained oscillator

Can be used as a absorption type frequency meter.

With indication meter

Large dial

Direct reading f Scale

Accessories:

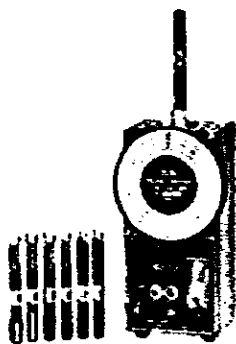
Case 1

Remarks:

A compact vacuum tube oscillator is contained.
 If the oscillator is coupled to a tuned circuit, the grid current will show a decrease or 'dip' when the oscillator is tuned through resonance with the unknown circuit.

It can thus used to measure resonance frequency.

Can be used as a absorption type frequency meter.



5-49 Digital frequency meter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	400	12	4,800

Specifications:

Same as No. 3-27

5-50 High-frequency bridge

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Ando Electric type YB-4	300	4	1,200

Specifications:

Frequency range: 100kHz - 5MHz

Measurement range:

1000kHz - 1 MHz

G: 10 - 11,110 $\mu\Omega$

C: 0 - 5,600pF

1 - 5MHz

G: 10 - 11,110 $\mu\Omega$

C: 0 - 1,000pF

Power source: AC 220V, 60Hz

Accuracy:

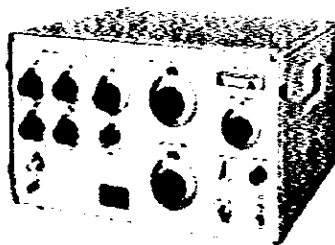
100kHz - 1MHz: within $\pm 5\%$

1 — 5MHz: within $\pm 10\%$

Self contained detector

Remarks:

Shall measure L, C and R constants of the antenna



5-51 Q meter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	300	6	1,800

Specifications:

Same as No. 3-36

5-52 Distortion factor meter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	300	12	3,600

Specifications:

Same as No. 5-46

5-53 Wave analyzer

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
NF kairo sekkei Frequency analyzer type TF-400-10	1,000	2	2,000

Specifications:

Frequency range: 5Hz - 20kHz or above
 Filter width: 5, 15, 50Hz, manual switching
 Input range: 0.01, 0.1, 1, 10V ES.
 Output: recorder output and log output
 Automatic sweep system
 With recording meter

Remarks:

Can analyze physical signals such as oscillation, noise, etc. frequency components and measure them by using the recording meter.

5-54 Oscillator

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	170	12	2,040

Specifications:

Same as No. 3-37

5-55 Standard signal generator

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Megro Denpa Sokki type MSG-221C	180	12	2,160

Specifications:

Frequency range: 100kHz - 30MHz

Output at open circuit: 100 - 0dB

Impedance: 50Ω

Modulation:

Range: 0 - 50%

Internal: 400Hz, 1,000Hz

External: 50Hz - 10kHz

Envelope distortion: less than 1.5% at 30%

Power source: AC 220V, 60Hz

Accessories:

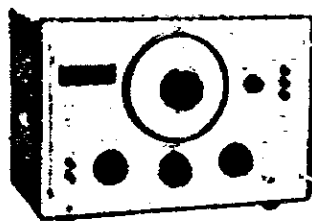
Power source cord 1

Output cable 1

Dummy antenna 1

Remarks:

Direct reading of frequency, less tracking system, frequency division, direct reading of output level, and automatic output adjustment.



5-56 Standard signal generator

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	400	6	2,400

Specifications:

Same as No. 3-38

5-57 Low-frequency oscillator

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	170	12	2,040

Specifications:

Same as No. 3-37

5-58 Special waveform generator

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	400	5	2,000

Specifications:

Same as No. 4-61

Remarks:

More than three output waveforms.

5-59 Sweep generator

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	600	6	3,600

Specifications:

Same as No. 3-41

Remarks:

Direct viewing of the characteristics of radio and TV sets.

5-60 LCR meter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	110	12	1,320

Specifications:

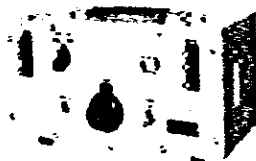
Same as No. 3-25

5-61 Amplifier

Room No. & name of facilities	---		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Ando Electric Type TA-18	200	6	1,200

Specifications:

- Gain: 15 to 60dB in 5dB steps**
- Frequency range: 30Hz to 10kHz**
- Input impedance: 600Ω /high, balanced**
- Maximum output: +15dBm**



5-62 Desk-top calculator

Room No. & name of facilities			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Cashio fx-17	9	32	288

Specifications:

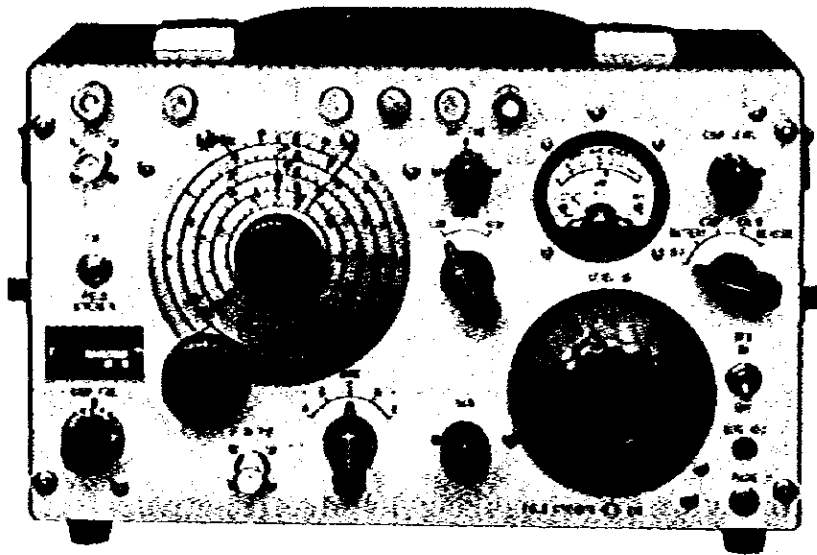
- Arithmetic operation function (including negative number and index)
- Square root
- (pi)
- Index substitution function
- Constant function
- Memory function
- Reciprocal function
- Trigonometric function
- Logarithmic function
- Complete floating point system
- Error indication
- Six or more digits (not including index and sine)

Accessories:

AC adapter 1

Remarks:

Desk-top electronic calculator for function.



5-64 Transistor characteristic display unit

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Iwatsu Semiconductor curve tracer type TT-506	700	1	700

Specifications:

1. Cathode ray tube: 5-inch
2. Vertical collector current: 10 μ A/div ~ 1A/div.
3. Vertical base voltage: 10mV/div - 0.5V/div
4. Horizontal collector current: 10mA/div - 50V/div
5. Horizontal base voltage: 10mV/div - 2V/div

Collector sweep voltage: 0 - 500V

PNP type and NPN type can be measured at the first quadrant.

Emitter earth connection and base earth connection: changeable

Characteristic curves: capable of repeating and single or group sweepings

Remarks:

Can draw the static characteristics of semiconductor elements on the cathode ray tube and measure the quantitative values.

5-65 Copier

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	400	2	800

Specifications:

Same as No. 1-4

5-66 Overhead projector

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	150	2	300

Specifications:

Same as No. 1-11

5-67 Automatic slide projector

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	120	2	240

Specifications:

Same as No. 2-35-3

5-68 Movie projector

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	750	2	1,500

Specifications:

Same as No. 1-12

5-69 Amplifier for lecture

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	150	2	300

Specifications:

Same as No. 1-8

5-70 Taperecorder

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—		—	190

Specifications:

Same as No. 3-57

5-71 VTR unit

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
---	1,000	2	2,000

Specifications:

Same as No. 1-15

5-73 Wires

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
---	6	180	1,080

Specifications:

Same as No. 3-59

Remarks:

A set of electric wires for wiring in a laboratory and maintenance.
Electric wires for simple experimental teaching materials.

5-74 Parts

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—			10,000

Specifications:

Same as No. 3-60

Remarks:

Measuring parts and terminals for experiment, and a set of parts for the assembly of simple experimental instruments.

5-75 Tool set

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	160	50	8,000

Specifications:

Same as No. 2-25-1 and 2-25-2

Remarks:

Tool set for the practice of radio and TV sets

A set of maintenance and repair tools for sheet metal processing (chassis processing, etc.) and each equipment

5-76 Tools for preparatory work

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	50	5	250

Specifications:

Same as No. 2-39

Remarks:

A set of maintenance tools for the practice of electronics

5-77 Workbench

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Workbench Chair	—	80	3,
	(total)	180	3,180

Specifications:

Same as No. 2-32

Desk for teacher	2 pcs.	x 30,000 yen =	60,000
Workbench (1,500 x 500mm)	35	x 30,000 =	1,050,000
Chair	90	x 4,500 =	405,000
Workbench (1,500 x 750mm)	42	x 30,000 =	1,260,000
Chair	90	x 4,500 =	405,000
		(total)	3,180,000

5-78 Locker

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	60	14	840
	55	12	660
	(total)		1,500

Specifications:

Same as No, 2-33

6. Electronics III

Cost of equipment :

price Thousand Yen : 93,729

price US \$: 480,662



6-1 High-frequency ammeter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	30	36	1,080

Specifications:

Same as No. 5-29

6-2 Electronic voltmeter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	100	8	800

Specifications:

Same as No. 4-27

6-3 Digital multi-meter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Yokogawa Electric Works Digital multi-meter type 2506	400	8	3,200

Specifications:

Measurement range:

DC-V: 0.1 1,000V (multi-range)

AC-V: 0.1 500V (")

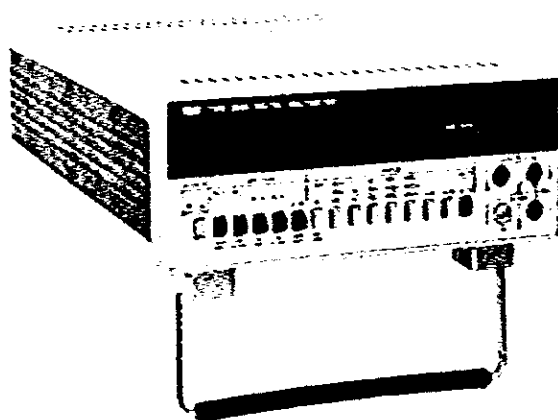
DC-A: 0.1 1,000mA (")

AC-A: 0.1 1,000mA (")

with external current transformer (clip-type)

Resistance: 10Ω - 100MΩ

Power source: AC 220V ± 10V, 60Hz



6-4 Electronic circuit tester

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Yokogawa Electric Works Electronic circuit tester type 3223	50	8	400

Specifications:

Measurement range:

- DC-V: 0.3 - 1,200V (multi-range)
- DC-A: 0.12 - 1,200mA (")
- AC-V: 3 - 300V (")
- Resistance: 2k - 200M (")

Input impedance: High impedance, 11M for DC, 1M for AC
with a built-in high- and input-impedance
DC amplifier using FET's

Accessories:

- Measurement lead 1 pair
- Carrying case with handle 1



6-5 DC voltmeter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
JIS C 1102 0.5 class type	20	30	600
JIS C 1102 2.5 class type	7	30	210
	(total)		810

Specifications:

Same as No. 4-23

6-6 DC ammeter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
JIS C 1102 0.5 class type	20	30	600
JIS C 1102 2.5 class type	7	30	210
	(total)		810

Specifications:

Same as No. 4-22

6-7 AC voltmeter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
JIS C 1102 0.5 class type	16	30	480
JIS C 1102 2.5 class type	7	30	210
	(total)		690

Specifications:

Same as No. 4-25

6-8 AC ammeter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
JIS C 1102 0.5 class type	16	30	480
JIS C 1102 2.5 class type	7	30	210
	(total)		690

Specifications:

Same as No. 4-24

6-10 Standard resistor

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	70	36	2,520

Specifications:

Same as No. 3-30

6-11 Standard Inductance

Room No. & name of facilities		—		
Name of manufacturer & type for reference		Unit price	Q'ty	Amount
Yokogawa-Hewlett-Packard	Standard inductors type SI-1	35	3	105
	SI-10	45	3	135
	SI-100	60	3	180
	Variable inductors type SI-B 10	134	3	402
	SI-B 50	162	3	486
	SI-B 500	173	3	519

Specifications: (total) 1,827

1. Standard inductors 6 for each
 Accuracy: more than $\pm 0.5\%$
 Safe current: more than 0.2A
 - (1) Inductance: 1 mH
 - (2) Inductance: 10mH
 - (3) Inductance: 100mH

2. Variable inductors 6 for each
 - (1) Inductance: 2 - 10mH, Accuracy: $\pm(0.5\% + 0.015\text{mH})$,
 Safe current: more than 0.6A
 - (2) Inductance: 10 - 50mH, Accuracy: $\pm(0.5\% + 0.075\text{mH})$,
 Safe current: more than 0.4A
 - (3) Inductance: 100 - 500mH, Accuracy: $\pm(0.5\% + 0.75\text{mH})$,
 Safe current: more than 0.1A

Remarks:

Standard inductance for contact inductance measurements.
 The long-term accuracy of the inductance values is insured.
 Few variation of inductance with humidity change.

6-12 Standard capacitor

Room No. & name of facilities		—		
Name of manufacturer & type for reference		Unit price	Q'ty	Amount
Yokogawa-Hewlett-Packard	Standard capacitors			
	Type CS-1000A	61	6	366
	CS-0.01	50	6	300
	CS-0.1	61	6	366
	CS-1	67	6	402
	Variable air capacitors			
	Type CDS-100	172	6	1,032
Decade capacitors				
Type 4440B	162	6	972	

Specifications: (total) 3,438

1. Standard capacitors 6 for each
 Accuracy: $\pm 0.2\%$
 (1) Capacity (between C_1 and C_2) : 1000pF
 (2) - ditto - : $0.01\mu F$
 (3) - ditto - : $0.1\mu F$
 (4) - ditto - : $1\mu F$
2. Variable air capacitors 6 sets
 Capacity: about 30 - 130pF
 continuously variable
3. Decade capacitors 6 sets
 Capacity: 40pF - $1.2\mu F$, decade dial steps

Remarks:

Standard instruments for contact measurements.

6-13 Q-meter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	300	3	900

Specifications:

Same as No. 3-36

6-14 Counter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	400	3	1,200

Specifications:

Same as No. 3-27

6-15 Absorption type frequency meter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	150	3	450

Specifications:

Same as No. 5-48

6-16 Oscillograph

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	620	1	620

Specifications:

Same as No. 4-62

6-17 X-Y recorder

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	550	8	4,400

Specifications:

Same as No. 4-63

6-18 Basic pulse circuit testing arrangement

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	300	2	600

Specifications:

Same as No. 4-19

6-19 Oscilloscope

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	150	8	1,200

Specifications:

Same as No. 5-42

6-20 Oscilloscope

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	200	8	1,600

Specifications:

Same as No. 3-43

6-21 Electronic galvanometer

Room No. & name of facilities	---		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Yokogawa Electric Works Electronic galvanometer type 2707	33	8	264

Specifications:

A high-sensitivity electronic galvanometer

Measuring range: 250 V 10%

Maximum sensitivity: 10 V/div.

Input resistance: approx. 9k

Response time: approx. 3 seconds

Power source: One 9V snap-in dry cell
(JIS C 8501 type 00) P or equivalent)



6-22 Sequence control experimental arrangement

Room No. & name of facilities	Dd 302 Workshop -1 EIII		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Kimura Electric Works	1,000	1	1,000

Specifications:

For the sequence control experiment by relay elements.

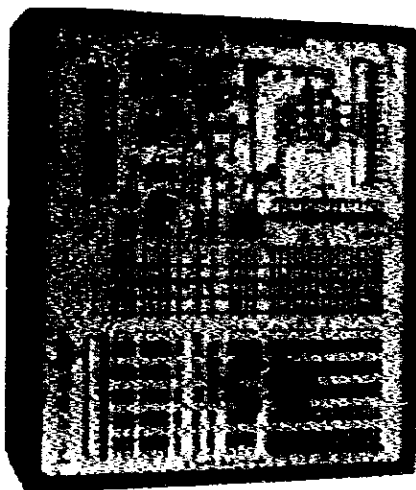
Kinds of relays:

1. Auxiliary relay: 2ab, 4ab 5 for each
2. Time limit relay: 0 - 1MIN, 0 - 10M 2 for each
3. Pilot relay: lamp and static display 20
4. Alarm: flicker device, 4-circuit buzzer 2
5. Power relay: 3ϕ 380V 20A 2
6. Power source: for converting supplied power source into necessary value.

Accessories:

- Connection cord (lead of plug to plug) lot

Should connect each terminal of the above elements on the graphic panel.



6-23 Logic sequence experimental arrangement

Room No. & name of facilities	Dd 302 Workshop-1 EIH		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Ando Electric	1,000	1	1,000

Specifications:

1. Various kinds of functions shall be assembled, and each unit consists of Tr of TTL level or IC logic element.
2. Kinds of logic circuits:
 - (1) AND circuit: 2 input, 4 input 5 for each
 - (2) OR circuit: - ditto - 5 for each
 - (3) NAND circuit: - ditto - 5 for each
 - (4) NOR circuit: - ditto - 5 for each
 - (5) Inv circuit 10
 - (6) FF circuit: J-K TYP 10
 - (7) Clock circuit: 0.1 - 100Hz, variable 1
 - (8) Single clock circuit 1
 - (9) Display circuit: LED TTL input level 20
 - (10) Power source circuit 1
 - (11) IC socket: 16P 6
3. This apparatus shall contain the above logic circuits in a portable case.
4. Accessories:
 - Preparatory circuit unit 2 for each
 - Connection cord: 20, 40cm 40 for each
 - 60cm 20

6-24 Servo mechanism experimental arrangement

Room No. & name of facilities	Dd 302 Workshop-1 EIII		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Ando Electric	1,000	1	1,000

Specifications:

1. For the fundamental practice of electric servo mechanism
2. Potentiometer: with $\Omega 360^\circ$ indication scale
 Input: 2
 Output: 2
3. Servo motor: AC 2-phase with potentiometer or gear coupler
 Output: 1W 2 pcs.
4. Amplifier: using semiconductor chopper
5. The above parts shall be exploded on the panel board.
6. Power source: for amplifier and standard input

6-25 Process control experimental arrangement

Room No. & name of facilities	Dd 302 Workshop-1 EIII		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	1,000	1	1,000

Specifications:

1. System construction

(1) Temperature control system:

Detection terminal: resistance or thermo-electric thermometer

Control meter: electric on-off control setting value:
within 20 - 100°C

Operation section: electro magnetic switch

(2) Water quality (water level) control system:

Detection terminal: a) water level of tank: electric differential pressure meter

b) flowmeter: electric flow type

c) orifice: for 3/8 inch

Control meter: electric on-off control with PI

Operation section: electric variable operating valve

(3) Plant construction:

Control tank: 250 ϕ x 500, 1kW heater x 2, with agitator

Water tank: 700 ϕ x 700

Others: refer to the outline chart of plant construction

2. Appearance

Stand type

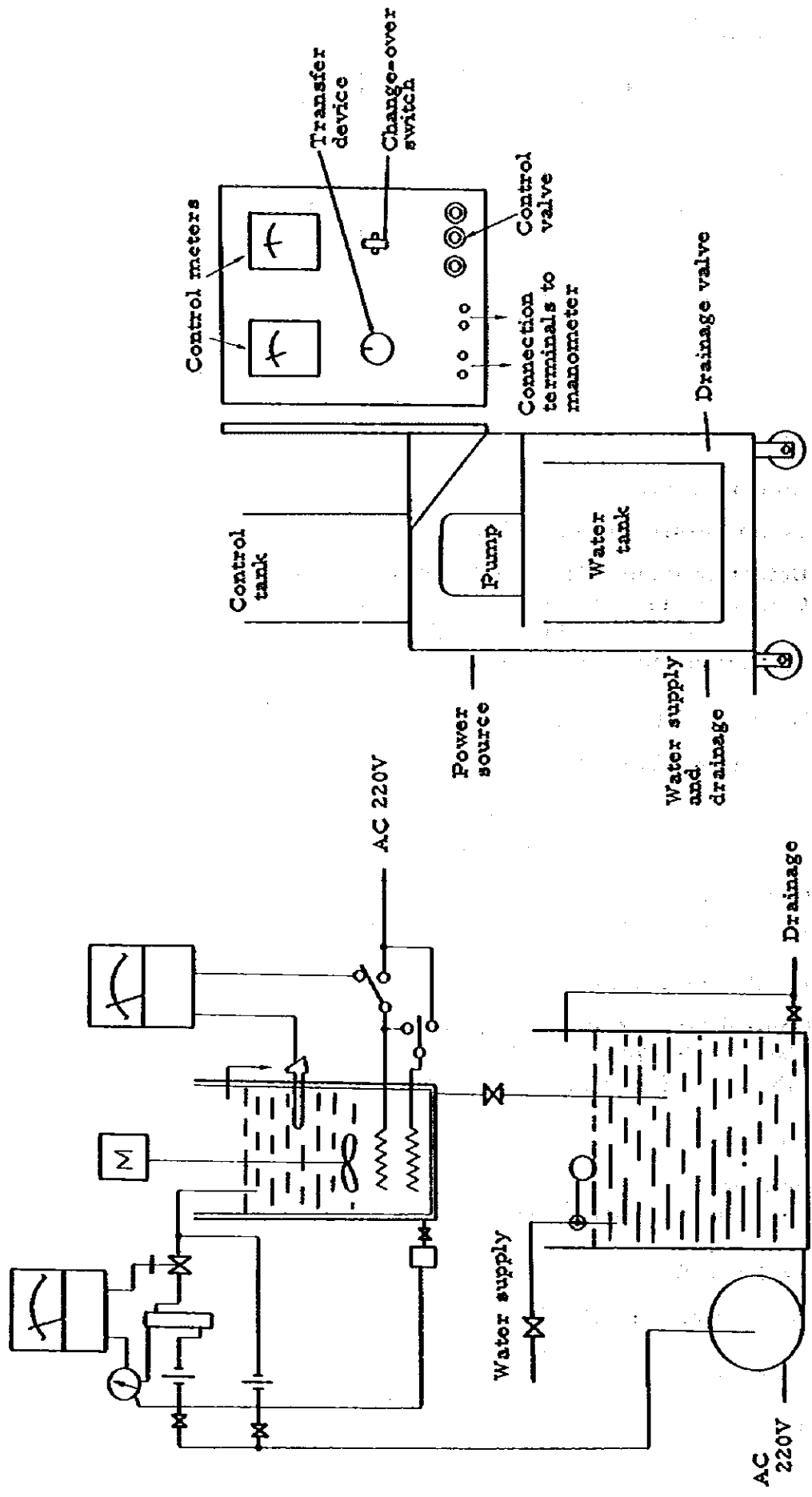
The measuring instruments shall be installed on a panel.

3. Connection with the outside

(1) Power source: AC 220V 5kVA
with connection cable (3m)

(2) Water supply: service water
3/8 inch, with connection hose (3m)

(3) Drainage: 1/2 inch



Constant pressure pump System construction

Outline of plant construction

6-26 Motor-generator automatic regulator

Room No. & name of facilities	Dd 302 Workshop-1 EIII		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	2,000	1	2,000

Specifications:

1. Motor generator

**Motor: Input voltage (100V)
Number of rotation (1,500 rpm)
Input (400W)**

**Generator: Output voltage (100V)
Output (400W)
Number of rotation (1,500 rpm)**

2. Automatic regulating circuit

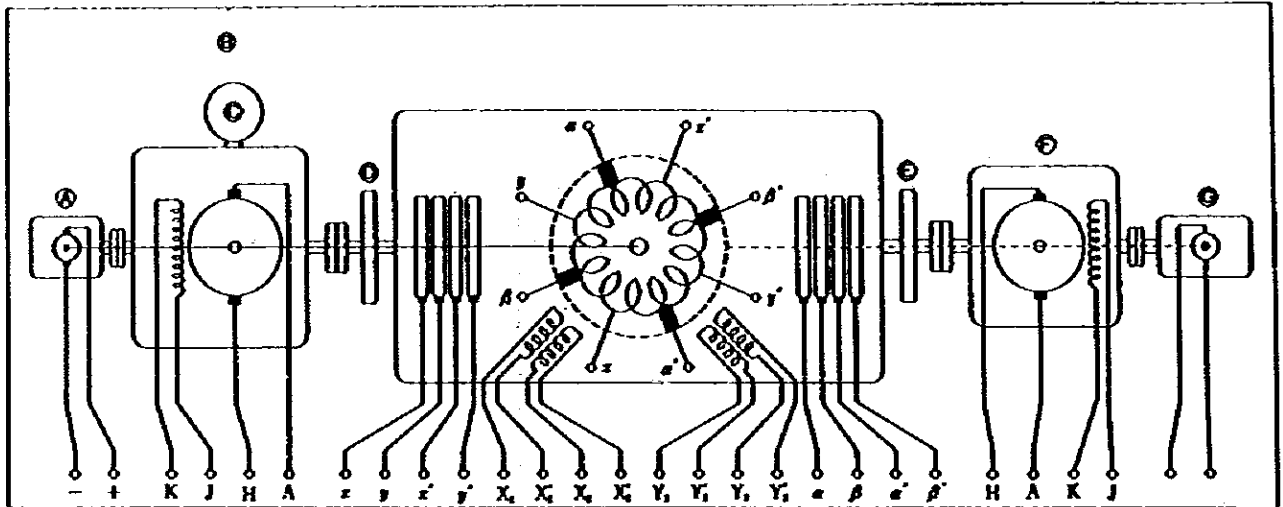
**Target value: 50 - 200%
Semiconductor amplifier
Detection of number of rotation
(frequency generator)**

3. Power source circuit

**Input: AC 220V
Output: DC 100V**

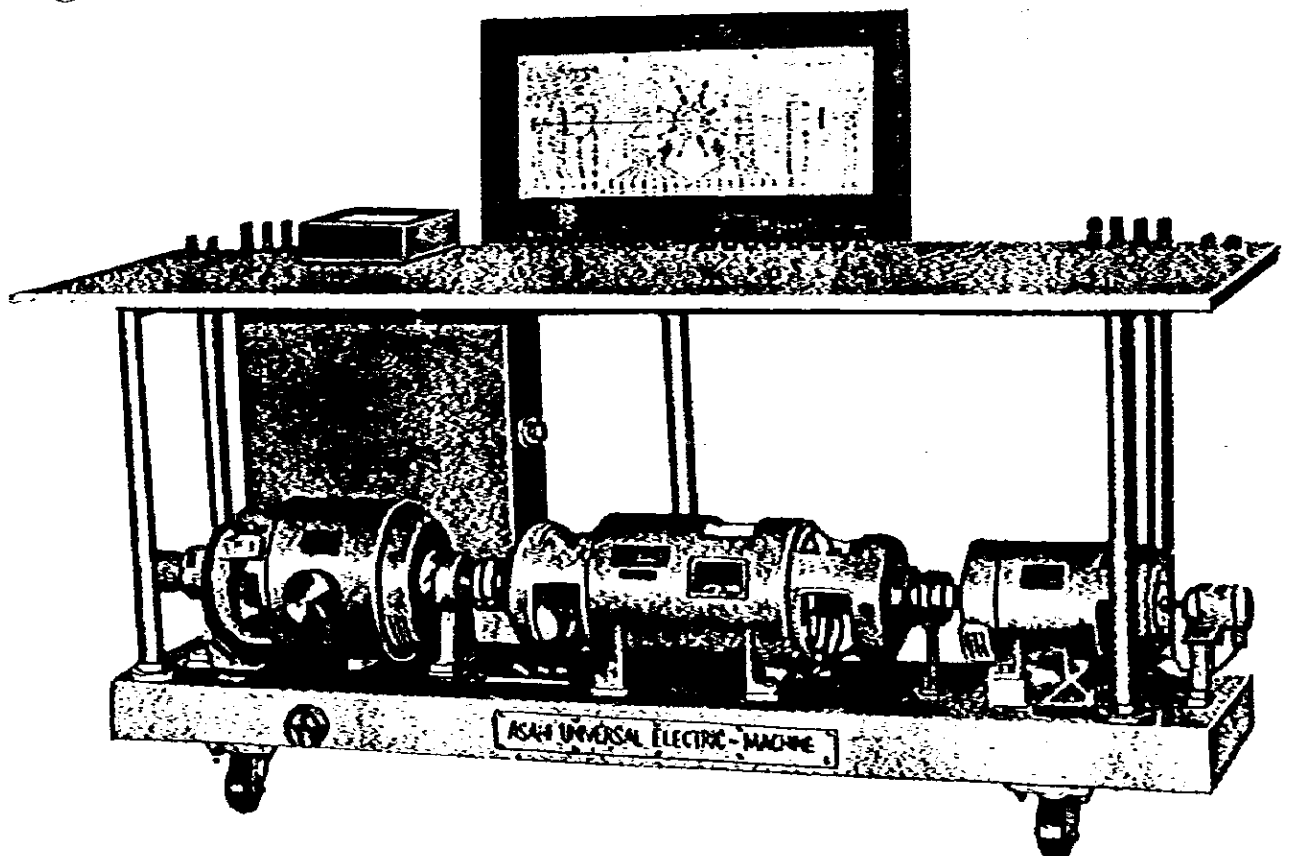
Remarks:

A testing device of automatic regulation capable of experimenting on each of the items of output voltage and speed of rotation of generator.



Universal electric machine

- Ⓐ D. C. tacho-generator
- Ⓑ Rotor brush driving motor
- Ⓒ Torque indicator
- Ⓓ Rotor brush position indicator
- Ⓔ Rotor brush position indicator
- Ⓕ Rotor brush driving motor
- Ⓖ A. C. tacho-generator



6-27 Electronic controller

Room No. & name of facilities	Dd 302 Workshop-1 EIII		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Hokushin Electric Works	500	8	4,000

Specifications:

1. Input: 1 - 5V, Output: 4 - 20mA
2. Control:
 - (1) Proportional band (P): 2 - 500%
 - (2) Reset time (I): 0.01 - 2.5M and 0.1 - 10M
 - (3) Rate time (D): 0.04 - 10M
 - (4) Indicating meter
Input and setting value: 0 - 100%
3. Recording:
 - (1) Electronic balance system: 2-pen (red and blue)
 - (2) Input: 1 - 5V
 - (3) Chart speed: 20 - 50 mm/MIN
4. Pulse converting unit for DDC

6-28 Transducer

Room No. & name of facilities	Dd 302 Workshop-1 EIII			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount	
Hokushin Electric Works Electronic temperature transducer type PB (EKT 204B)	150	3	450	

Specifications:

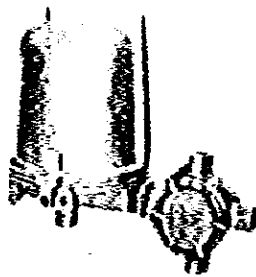
1. A temperature transducer converting a resistance input into a unified si.
2. Input span:
Resistance bulb: Pt 100 Measuring range: -200 - +500°C
Max. span: 12°C
3. Output signal: 1 - 5V and 4 - 20mA

6-29 Transducer

Room No. & name of facilities	Dd 302 Workshop-1 EIH			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount	
Hokushin Electric Works Electronic pressure transmitter type F50EP1000	150	3	450	

Specifications:

1. Can detect a fluid pressure of process liquid, gas or vapor, and transmit a unified DC current signal, using a force balance mechanism.
2. Measuring pressure range: 0 - 10kgf/cm²
3. Output signal: 4 - 20mA



6-30 Elevator control model

Room No. & name of facilities	Dd 302 Workshop-1 EIII		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Asahi Electric selling Diagram of sequence control experimental apparatus	3,000	1	3,000

Specifications:

1. A model elevator for sequence control
2. Two cages to be installed in parallel
3. Call button on each floor, destination display in cage, cage door, floor door
4. All output shall be collected on the terminal board.
Input TTL interface
5. Standard control circuit: by microcomputer, shall be a programmable sequence circuit.
6. Input for control shall be TTL level.

Remarks:

1. A low speed is sufficient for the model cage, but due consideration shall be given for safety.
2. A terminal board shall be installed for the control system so that connection of control switch, etc. can be made from outside.
3. The power source (AC) to be obtained in situ and converted into required voltage.

- | No | Designation |
|----|---|
| ① | Inscription board |
| ② | Button switches for operation of ascend, stop and descend, auto-manual switch |
| ③ | Button switches for instruction and call of lift |
| ④ | Power source connector for control circuit |
| ⑤ | Fuse |
| ⑥ | NO-fuse breaker |
| ⑦ | Main power source connector |
| ⑧ | Motor |
| ⑨ | Electromagnetic contacting device |
| ⑩ | Limit switch |
| ⑪ | Basket |
| ⑫ | Graphic panel for lift control circuit |
| ⑬ | Graphic panel for lift operation circuit |
| ⑭ | Training board |
| ⑮ | Terminal board |

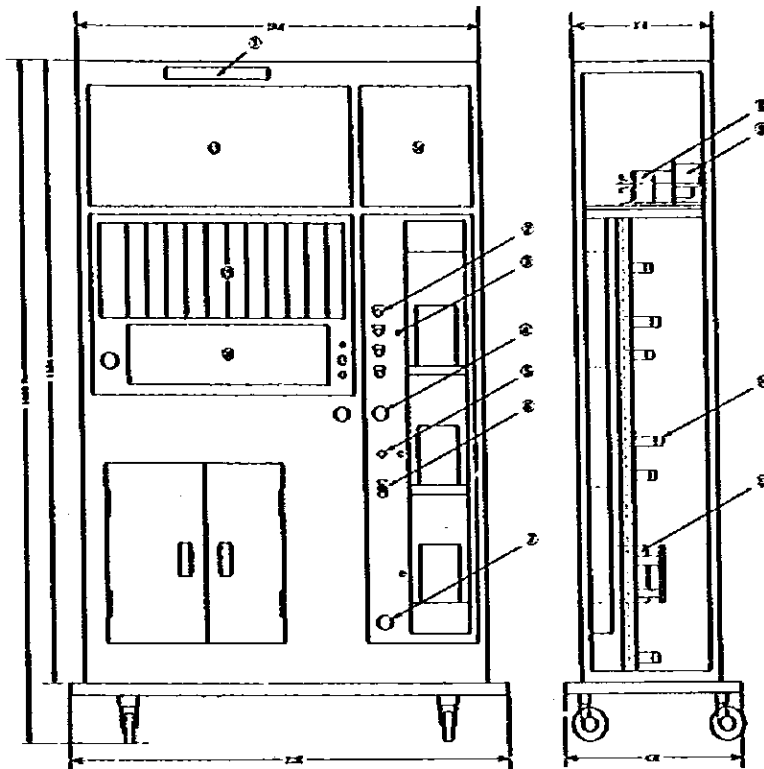


DIAGRAM OF SEQUENCE CONTROL EXPERIMENTAL APPARATUS

6-31 Temperature control model

Room No. & name of facilities	Dd 302 Workshop-1 EIII		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	4,000	1	4,000

Specifications:

The model shall consist of the following parts.

1. Cold (warm) water production plant

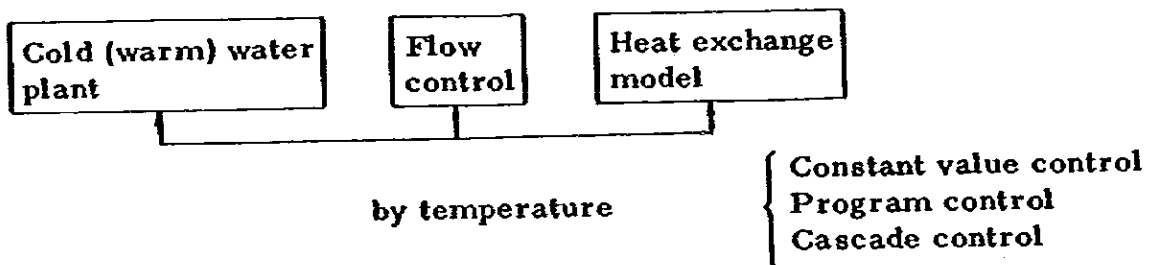
A certain amount of water is cooled into cold water.
(ON-OFF control, PI control)

2. Flow control system for sending out the cold water

(Flow measuring, servo-value)

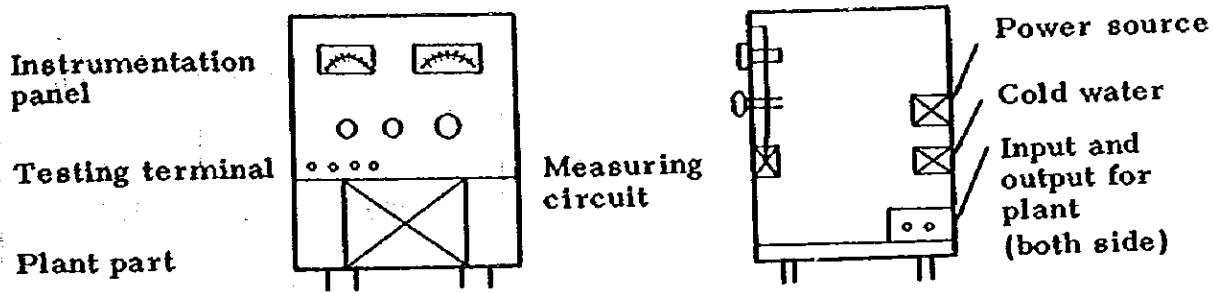
3. Heat exchanging mechanism

Measuring air volume, model room temperature control, cascade control of room temperature, air volume, water volume, cold water temperature.



4. Summary of structure of each plant

All of said parts shall be assembled into one body along with controlling panel (instrumentation) and instruments, and connection with other parts shall be made by means of water hose, electric wire and connectors.



The plant shall be a combination of the three parts, each in an independent box, containing instruments and testing terminals for independent practice in each part, with connection to allow a comprehensive practice.

Remarks:

1. To be so devised that the model is capable of functioning in various mode for practice on automatic control by students.
2. Capable of periodical maintenance of the functions of all parts of the model.
3. Connection of power and cooling water to the specified distribution board and tap in the laboratory.

6-33 Electronic computer

Room No. & name of facilities	Dd 305 Workshop-2 EIII		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	15,000	1	15,000

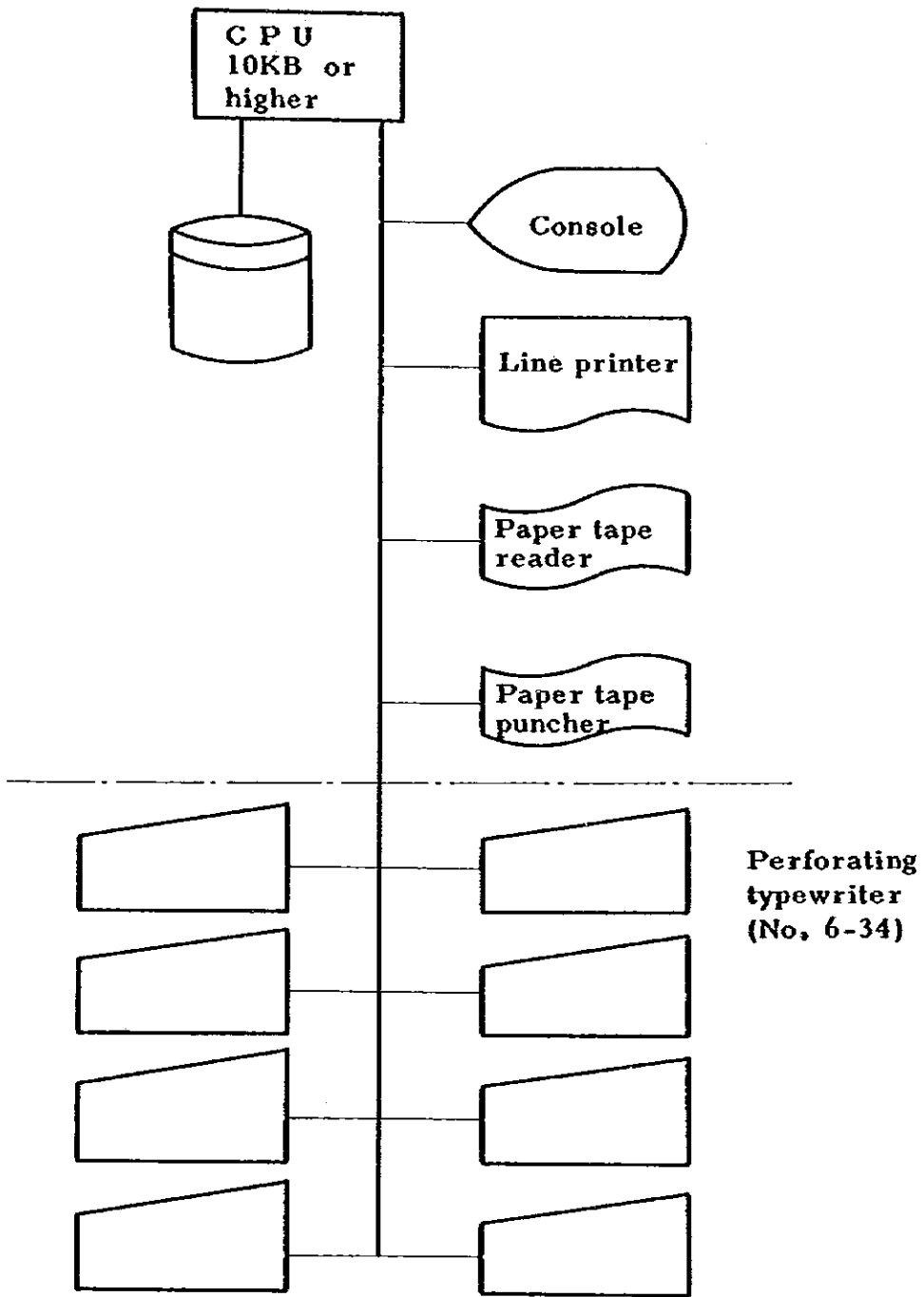
Specifications:

1. Structure of hardware

- (1) CPU: 16KB or higher, with operating panel
- (2) External scale: desk file, 2 - 5MB
- (3) Input equipment: console display
high speed paper tape reader: 1000 c/s (ISO)
- (4) Output equipment: line printer 400 line/min. or higher
paper tape puncher 200 c/s
- (5) Input and output: 8 typewriters can be used

2. Software

- (1) OS: disc-centered operating system
- (2) Processing program, assembler, FORTRAN, BASEC, etc.
- (3) Capable of simultaneous processing with 8 typewriters
- (4) Other functions required for practice



6-34 Perforating typewriter

Room No. & name of facilities	Dd 305 Workshop-2 EIII		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	1,000	8	8,000

Specifications:

Paper tape: 8 unit
 Perforating speed: 20 c/s
 Typewriting function: 120 c/line, 20 c/s
 Kinds of characters: English, figure, mark
 Code: ISO
 Used power: 300VA
 Weight: 150kg
 Can connect with CPU

6-35 Paper tape cabinet

Room No. & name of facilities	Dd 305 Workshop-2 EIII		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	100	1	100

Specifications:

Same as No. 11-5

6-36 Power unit

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	100	8	800

Specifications:

Regulated DC power supply

Output voltage: 0 - 30V, continuously variable

Output current: 0 - 6V or more

With output volt-meter and ammeter

With automatic protection circuit in order to protect accidents such as over-load and short-circuit

6-37 Power unit

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	100	8	800

Specifications:

DC stabilized power supply:

Output: 0 - 20V 2A

It provides output current control circuit to protect accidents such as over-load and short-circuit.

With output voltmeter and ammeter

6-38 AC voltage stabilizer

Room No. & name of facilities	Dd 305 Workshop-2 EIII		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	500	2	1,000

Specifications:

Single phase, Output: 100V 10kVA

Stability: $\pm 5\%$

With input voltmeter, output voltmeter, ammeter, output switch, no-fuse type

Remarks:

1. To be used for stabilizing the power source of electronic computer used for practice.
2. Including load wiring from the distribution board in Practice room.

6-39 Oscillator

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	400	8	3,200

Specifications:

Same as No. 4-61

6-40 Oscillator

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	400	8	3,200

Specifications:

Same as No. 3-38

6-41 Oscillator

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	400	3	1,200

Specifications:

Same as No. 4-61

6-42 Study desk and chair

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Student desk	40	45	1,800
Student Chair	6	90	540
	(total)		2,340

Specifications:

Student desk: 1,500 x 500 x 700 - 740H m/m
 45 sets x 40,000 yen = 1,800,000 yen

Student chair 90 x 6,000 = 540,000 yen

(total) 2,340,000 yen

6-43 Workbench

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Workbench	-	34	3,140
Chair	5	130	650
	(total)		3,790

Specifications:

Same as No. 2-32

Dimension:

1. 2,000 x 1,200 x 760H m/m
 30 sets x 100,000 = 3,000,000 yen
 2. 1,500 x 500 x 760H m/m
 2 sets x 30,000 = 60,000 yen
 3. 1,500 x 750 x 760H m/m
 2 sets x 40,000 = 80,000 yen
-
- (total) 34 3,140,000 yen
- Chair 130 sets x

6-44 Movable blackboard

Room No. & name of facilities	Dc 312, Dd 307, 308 Lec. EIII Dd 302, 304, 305 Workshop-1, 2, 3 EIII		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	50	6	300

Specifications:

Same as No. 2-34

6-45 Locker

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	60	16	960

Specifications:

Same as No. 2-33

6-46 Copier

Room No. & name of facilities	Dd 306, 312 Instructor's Office		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	400	2	800

Specifications:

Same as No. 1-4

6-47 Overhead projector

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	150	4	600

Specifications:

Same as No. 1-11

6-48 Movie projector

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	750	2	1,500

Specifications:

Same as No. 1-12

6-49 Slide projector

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	120	2	240

Specifications:

Same as No. 2-35-3

6-50 VTR unit

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	1,000	2	2,000

Specifications:

Same as No. 1-15

6-51 Amplifier for lecture

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	150	2	300

Specifications:

Same as No. 1-8

6-52 Taperecorder

Room No. & name of facilities			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Portable stereo cassette recorder	60	8	480
Tape	0.5	240	120
	(total)		600

Specifications:

Same as No. 3-57

7. Radio Engineering

Cost of equipment :

price Thousand Yen : 219,520

price US \$: 1,125,744

7-1 Radio receiver for measurement

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	10	32	320

Specifications:

Amplitude modulation system for home use

8 transistors or more super-heterodyne system

Receiving frequency:

535kHz - 1,600kHz or above

4MHz - 12MHz or above

Output: more than 1W

Power source: JIS C 8501 type UM-1

Remarks:

Each section of this radio receiver shall be easy to operate and observe, and has measuring terminal.

Home type

With AM-SW change-over switch

With case

7-2 FM radio receiver for measurement

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	20	32	640

Specifications:

Home type FM radio receiver: superheterodyne system

Receiving frequency: specified in situ

Output: more than 1W

Power source: dry cells (JIS C8501 type UM-1)

Remarks:

(Home type)

FM radio receiver for measurement training, in a cabinet

It shall not be too small, and has measuring terminals.

Each section can be easy to observe.

7-3 Exploded demonstration radio receiver

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	30	8	240

Specifications:

**Exploded AM-FM radio receiver with SW band: superheterodyne system
Compact type and assembled according to the circuit diagram.**

Receiving frequency: specified in situ (with AM-SW change-over switch)

Sensitivity: very weak electric field class

Output: more than 1W

Power source: dry cells (JIS C8501 UM-1) and AC

Remarks:

Radio receiver assembled according to the circuit diagram.

Each section has testing terminals.

7-4 AM/FM transmitter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	200	4	800

Specifications:

AM-FM modulation system: for practice.

Output: more than 10W

Load resistance and lamp load changeover type

Transmitting frequency: 1MHz, 5MHz, 20MHz, 100MHz, etc.

Crystal oscillation system: waveforms of each section can be observed.

With cassette tape recorder

Accessories:

1. Output meter
2. Simple antenna

Remarks:

AM/FM transmitter for students' practice and experiment

Not compact type

Portable type

Each section shall be assembled on a panel.

Can be used for signal source for AM receiver.

7-6 FM stereophonic transmitter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	50	1	50

Specifications:

- Output: 10W
- Dummy antenna/lamp load change-over switch
- All transistor type
- Crystal control system: 90M band
- Practice of stereo broadcasting: possible
- Frequency: specified in situ
- Cassette tape recorder with 10 tapes for stereo
- stereo microphone

Remarks:

- Exploded 10-W stereo transmitter assembled on a rack
- Easy measurement for practice
- Can be used for signal source for adjusting FM receiver

7-7 Radio characteristics measuring console

Room No. & name of facilities	Db 304, 305 Lab, Shield RA.		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	1,500	30	45,000

Specifications:

Bench for radio practice: equipped on the upper part with said terminals and measuring instruments, with chair.

Electronic volt-resistance meter

Clamp-on DC ammeter: 3mA - 1A

Signal oscillator (output 1V): spot or variable
Sweep oscillator: for IF, RF

} Both can be
 integrated data
 processing

CRT tube oscilloscope

DC stabilized source: 0 - 30V, 1A

Low-frequency oscillator: 5 spots or more

High frequency variable resistance attenuator: can be one with built-in SG

Power source: AC 220V, 60Hz

Accessories:

1. a set of tools
2. A set of wiring materials
3. Switches for alteration (bipolar, double throw) ... 3
4. Lead wires for measurement 20 couples
5. Lead wires with alligator clip 20
6. Sealed wires with banana, alligator clip 10

Remarks:

Capable of measuring characteristics of every part of a radio receiving set and investigating the comprehensive characteristics.

To be set on a desk including power unit.

To include tools and wiring parts of every kind required.

To be centralized signal system or a combination of individual measuring instruments, equipped with a stabilized source.

7-8 Transmitter adjusting and measuring rack

Room No. & name of facilities	Db 304, 305 Lab, Shield RA		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Fujisoku	500	4	2,000

Specifications:

Frequency range: 0.5 - 30MHz or above

Electric power measurement: pass type wattmeter

Measuring range: 0 5 30W (changeable), Full within: $\pm 10\%$

Input impedance: 75Ω , 50Ω

Linear detector:

Modulation frequency range: 100Hz - 10kHz

Measuring range: 0 - 8kHz, 0 - 20kHz

accuracy: $\pm 5\%$ (full scale)

Waveform observation: possible (using terminal)

Low-frequency oscillator:

1. Frequency: 300Hz, 1, 2, 3kHz

Accuracy: $\pm 5\%$

2. Output level: -20dBm - +5dBm (600Ω)

3. Output impedance: 40, 60, 600Ω

Accuracy: $\pm 20\%$

Level meter:

Frequency range: 100Hz - 10kHz

Input impedance: 600Ω and high

Measuring range: 15mV - 50V

DC ammeter:

Measuring range: 50 A, polarity changeable

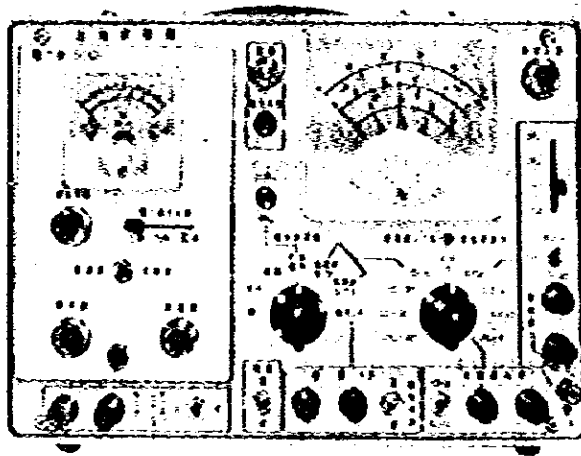
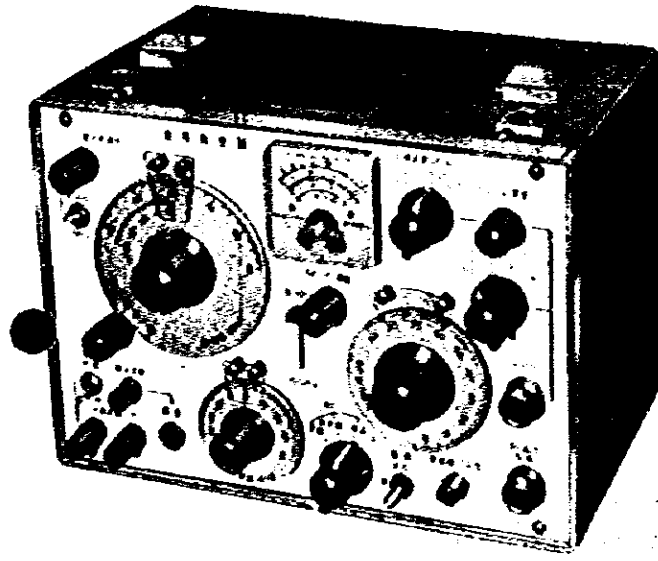
Measuring accuracy: 2.5% (full scale)

**Signal generator: 0.5 30MHz or above
with an output attenuator**

Remarks:

An equipment for testing MW and SW transmitters.

Shall be installed on the portable rack for student's practice.



7-9 Circuit tester

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Sanwa Electric Instrument Type EM-1000	30	10	300

Specifications:

Measuring range:

- ±DC-V: 10, 30mV, 0.1, 0.3, 1, 3, 10, 30, 100, 300, 1k, 30kV
- AC-V: 10, 30mV, 0.1, 0.3, 1, 3, 10, 30, 100, 300, 1kV (p-p value proportional type)
- dB: -59.5 ~ 61.5, -69.5 ~ 59.5 (11 ranges)
- ±DC-A: 0.01, 0.1, 1, 10, 100, 300μA, 1, 3, 10, 30, 100, 300mA, 1, 10A
- AC-A: 0.1, 1, 10, 100, 300μA, 1, 3, 10, 30, 100, 300mA, 1, 10A
- ohm: 100, 1k, 10k, 100k, 1M, 10M, 100M, 1000M,
(Minimum value: 0.01Ω , central value: 0.5Ω)

Accessories:

1. Dry cells 2 sets
2. Standard accessories 1 set

Remarks:

self-calibration

7-10 Electronic volt & ohm meter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	30	10	300

Specifications:

Same as No. 3-22

7-11 High-sensitivity voltmeter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	100	30	3,000

Specifications:

Same as No. 4-27

7-12 Voltmeter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
DC voltmeter	20	50	1,000
AC voltmeter	16	10	160
	(total)		1,160

Specifications:

Same as No. 3-23

1. DC voltmeter

- 0.3/1/3/10 (V) 30 sets
- 3/10/30/100 (V) 10
- 30/100/300 (V) 10

2. AC voltmeter

- 75/100 (V) 10

7-13 Ammeter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
DC ammeter	18	40	720
AC ammeter	14	20	280
	(total)		1,000

Specifications:

Same as No. 3-24

1. DC ammeter

- 3/10/30/100 (μ A) 20 sets
- 1/3/10/30 (mA) 10
- 10/30/100/300 (mA) 10

2. AC ammeter

- 20/100 (mA) 10
- 0.2/1 (A) 10

7-14 High-frequency ammeter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	30	10	300

Specifications:

Same as No. 5-29

Range: 5/10/20/50 (mA) 10 sets

7-15 Digital voltmeter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	150	17	2,550

Specifications:

Same as No. 4-28

7-16 Resistor

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	30	36	1,080

Specifications:

Same as No. 3-29

- 1. 4,800Ω 18 sets
- 2. 600Ω 18 sets

7-17 Resistor

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	70	36	2,520

Specifications:

Same as No. 3-30

7-18 Resistance attenuator

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Ando Electric Variable attenuator type AL-401	50	17	850

Specifications:

Frequency range: DC to 50MHz

Characteristic impedance: 75Ω unbalanced

Attenuation step: 0.1dB x 10, 1dB x 10, 10dB x 5, 30dB x 1

Attenuation range: 0 to 91dB

Remarks:

**Resistance attenuators for high-frequency
Handy-type**



7-19 Filter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Ando Electric and others type LF-5 and others	200	17	3,400

Specifications:

Variable low pass filters 10 sets

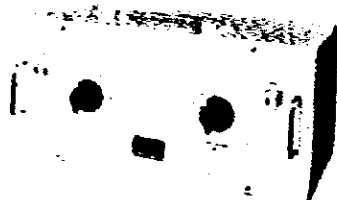
Frequency range: 50kHz - 6MHz
 Characteristic impedance: 75Ω unbalanced
 Cut-off frequency: 60-84-120-170-240-340-480-680-970-1370-
 1900-2600-3600-4100-6000MHz (15 frequencies)

Variable high pass filters 7 sets

Frequency range: 50kHz - 30MHz
 Characteristic impedance: 75Ω unbalanced
 Cut-off frequency: 70-100-140-200-280-400kHz-0.56-0.8-1.2-
 1.6-2.4-3.2-4.8-6.4-9.6-12, 8MHz (16 frequencies)

Remarks:

Variable filters for radio



7-20 Standard inductance

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	65	17	1,105

Specifications:

Same as No. 4-53

7-21 Standard variable capacitor

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	30	17	510

Specifications:

Same as No. 4-54

7-22 Megger

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	20	2	40

Specifications:

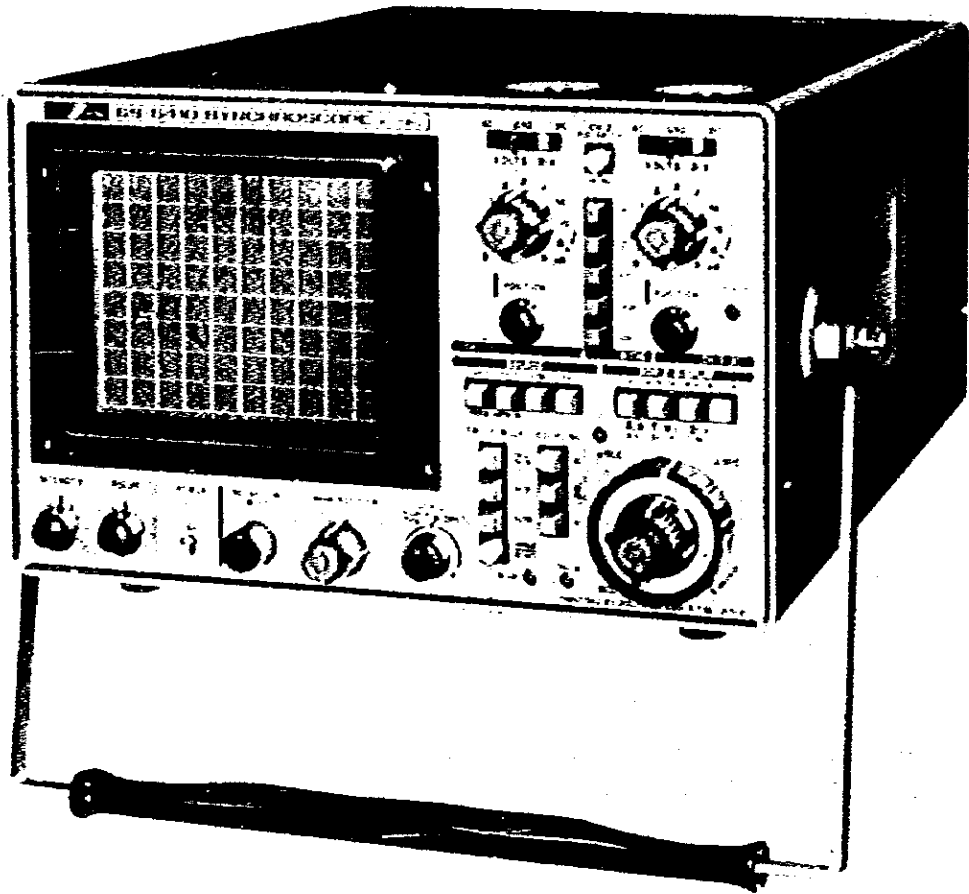
Same as No. 3-26

7-23 Oscilloscope

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	200	10	2,000

Specifications:

Same as No. 3-43



7-25 X-Y recorder

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	550	12	6,600

Specifications:

Same as No. 4-63

7-26 Oscillograph

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	620	3	1,860

Specifications:

Same as No. 4-62

7-27 Sampling transducer

Room No. & name of facilities		—		
Name of manufacturer & type for reference		Unit price	Q'ty	Amount
Iwatsu Electric	Samploscope type SAS-601B	500	3	1,500

Specifications:

Sampling oscilloscope

It has a built-in circuit sampling system to convert superhigh speed phenomenon to low speed.

Vertical deflection system (at both CH1 and CH2)

Sampling head SH-18

SH-3B

SH-48

Bandwidth

DC-3.5GHz, -3dB

DC-6GHz, -3dB

DC-12.4GHz, -3dB

Vertical plug-in unit: V-11B and V-12B

Sensitivity:

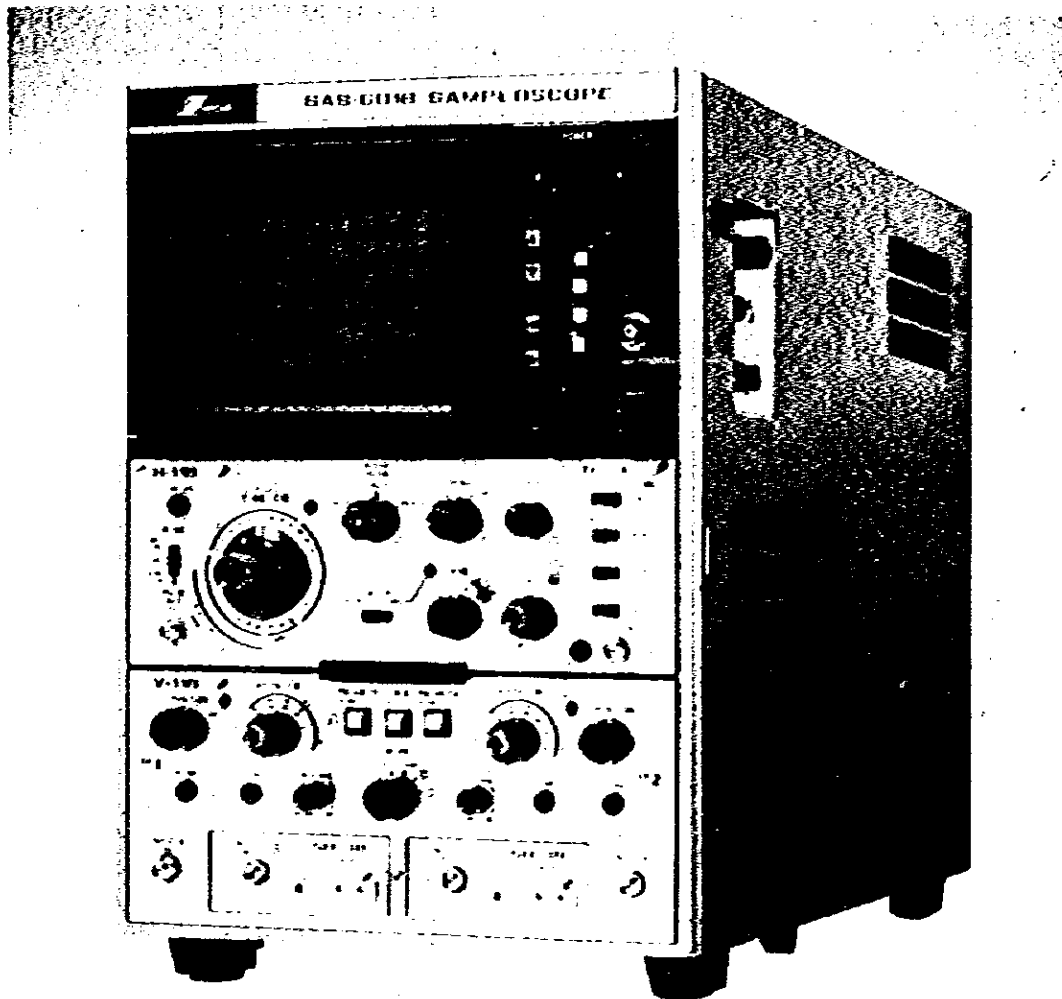
1mV/cm - 0.2V/cm, 1-2-5 sequence in 8 calibrated steps

0.4mV/cm - 0.2V/cm continuously variable with VARIABLE control

Horizontal deflection system

Horizontal plug-in unit: H-11B

Power source: AC 220V, 60Hz



7-28 Wave meter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Mita Musen Grid dip meter type WB-200	50	17	850

Specifications:

Same as No. 5-48

7-29 Frequency meter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	400	17	6,800

Specifications:

Same as No. 3-27

7-30 High-frequency bridge

Room No. & name of facilities			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
	300	3	900

Specifications:

Same as No. 5-50

7-31 Radio frequency bridge

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Muta Musen Type 1200	240	3	720

Specifications:

Measuring range: 0.5 - 20MHz
 10Ω - 1,000
 direct reading on dial

Input impedance of antenna, feeder and receiver, and output impedance of transmitter can be measured.

Signal source: Grid-dip meter

7-32 Q-meter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	300	17	5,100

Specifications:

Same as No. 3-36

7-33 Standard signal generator

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	400	2	800

Specifications:

Same as No. 3-38

7-34 Test oscillator

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Leader Type LSG-16	20	10	200

Specifications:

Frequency: 100kHz - 300MHz or above

Accuracy: $\pm 1.5\%$

Output voltage: 0.1 Vrms

Output attenuator: Low-High change-over, continuously variable

Modulation system: AM

Internal modulation frequency: 1000Hz, 30% modulation

External modulation: 50Hz - 20kHz

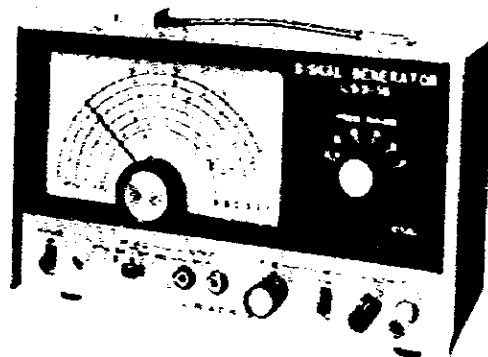
External modulation voltage: 1 Vrms

Low-frequency output: 1kHz

Remarks:

Wide frequency range.

Handy type



7-35 Oscillator

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	170	4	680

Specifications:

Same as No. 3-37

7-36 Sweep generator

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	600	4	2,400

Specifications:

Same as No. 3-41

7-37 Amplifier

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	200	3	600

Specifications:

Same as No. 5-61

7-38 Amplifier

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	200	2	400

Specifications:

Same as No. 5-61

7-40 Transistor characteristics display unit

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	400	2	800

Specifications:

Same as No. 3-32

7-41 Transistor checker

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	350	12	4,200

Specifications:

Same as No. 3-34

7-42 IC tester

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	200	8	1,600

Specifications:

Same as No. 3-33

7-43 LCR meter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	110	12	1,320

Specifications:

Same as No. 3-25

7-44 Field strength meter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Anritsu Field strength meter type M-262E	300	12	3,600

Specifications:

Frequency: 500kHz - 30MHz or more
Field strength measuring range: 18 - 130dB or more
Measuring accuracy: ± 2 dB
Bandwidth: ≥ 4 kHz (3dB)
Image ratio: ≥ 40 dB at 2.9MHz or below
 ≥ 12 dB at 17 to 30MHz

Antenna: loop antenna (x 5)
If output: 455kHz
Comparison oscillator: self oscillator coupled electromagnetically to antenna

Indication: average value
Monitor: A1, A2 and A3 monitoring are provided
Power: Batteries SUM-3 x 8 (12V) and AC

- Accessories:**
1. One instrument cover
 2. One cover of antennas
 3. Eight SUM-3 batteries
 4. Five loop antennas
 5. One earphone

Remarks:

The field strength of wide range frequencies can be measured easily.

7-45 Impedance bridge unit

Room No. & name of facilities		—		
Name of manufacturer & type for reference		Unit price	Q'ty	Amount
Ando Electric	Direct reading impedance bridge type DRZ-2M	160	2	1,140
	Oscillator type TCO-22B	120		
	Detector-amplifier type ED-9	290		

Specifications:

Frequency range: 200Hz to 100kHz

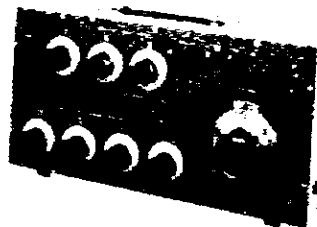
Measuring range: Z: 10 to 10,000
 $\angle \phi$: 0 to $\pm 90^\circ$

Resolution: Z : 0.1
 $\angle \phi$: 0.5°

Accuracy: Z : $\pm (1\% + 0.2\Omega)$, 0.2 to 70kHz: at 50 to 3,000 Ω balanced circuit

Accessories:

1. Detector-amplifier 1 set
2. Oscillator 1 set



7-46 Large-output stereophonic amplifier

Room No. & name of facilities		Db 308 Lab. Anechoic RA		
Name of manufacturer & type for reference		Unit price	Q'ty	Amount
PIONEER	Type C-1500	30	32	960
	Type M-1500	40	32	1,280
SONY	Type DR-25	3	32	96
PIONEER	Type JC-2	0.5	160	80
		(total)		2,416

Specifications:

1. Power amplifier:

Effective output: 30W + 30W or above (20Hz - 20kHz, both channel driving, 8Ω)
 Input sensitivity/impedance: about 1V/50kΩ
 High harmonic wave distortion factor: 0.05% at max. (at effective output: 20Hz - 20kHz)
 Output band width: 10 - 40kHz (both IHF channel driving)
 Frequency characteristics: 5 - 100kHz ± 1dB
 S/N ratio: 100dB or above (IHF-A)
 Dumping factor: 30 or above
 Residual noise: 0.2mV or below

2. Pre-amplifier:

Input sensitivity/impedance: PHONO: 2.5 - 3.5mV/47 - 50kΩ
 others: 150 - 200mV/50 - 100kΩ
 PHONO RIAA deviation: ± 0.5dB or below (20 - 15kHz)
 PHONO: 70dB or above (IHF-A network 2.5 - 3.0mV)
 others: 90dB or above (IHF-A network)
 Maximum allowable input to PHONO: 200mV or above (1kHz)
 Output level/impedance: REC OUT: 150mV or above/1kΩ or below
 PRE OUT: 1V/1kΩ or below
 High harmonic wave distortion factor: 0.05% or below
 (at 1V PHONO output)
 0.03% or below
 (at 1V other output)
 Frequency characteristics: 20 - 50kHz ± 1dB
 Tone control: BASS: about 100Hz ± 10dB
 TREBLE: about 10kHz ± 10dB
 Subsonic filter: about 15 Hz, -6dB ~ -12dB
 Loudness control: about 100Hz + 6dB, 10kHz + 3dB

Accessories:

1. Open-air type head-phone 32 sets
Equivalent to SONY type DR-25
2. Stereo connection cord 160
with two pin plugs at both ends
Equivalent to PIONEER type JC-2

Remarks:

Power amplifier:

- AC power source: can be used.
- Right and left levels shall be controlled independently.
- Power supply shall be separated previously.

Pre-amplifier:

- PHONO, AUX, TAPE, and TUNER terminals shall be provided.
- Output volume and balance controls shall be provided.
- AC power supply
- RIAA equalizer shall be built in.

7-47 Mixer amplifier

Room No. & name of facilities		Db 308 Lab. Anechoic RA		
Name of manufacturer & type for reference		Unit price	Q'ty	Amount
TEAC	Type M-2	60	32	1,920
	Type MB-20	40	32	1,280
SONY	Type EC-10A	2	64	128
		(total)		3,328

Specifications:

Input sensitivity/impedance: MIC: about -60dB/10kΩ or below
 LINE: -5 ~ -10dB/30kΩ ~ 100kΩ
 MIC: -30dB or above at ATT off
 LINE: +20dB or above

Load impedance: 10kΩ or below

Maximum output level: +14dB or above

Peak margin: +24dB or above

S/N ratio: 70dB or above at single input
 65dB or above at total input

Frequency characteristics: 30Hz - 20kHz or above, ±2dB or below

Distortion factor: 0.15% or below

Volume attenuation: 60dB or above

Accessories:

1. Microphone cord 64 pcs.
 with standard plug and standard jack
 Equivalent to SONY type EC-10A

Remarks:

Input: more than 6 channels
AC power source: can be used.
 With meter at each output channel (accessories can be used.)
 With microphone ATT (-10 ~ -20dB)
 With output channel selector
 With self-contained headphone amplifier (accessories can be used.)
 High and low cutting filter shall be provided.
 With pampot mechanism at more than 2 channels
 With master volume

7-49 Speaker

Room No. & name of facilities	Db 308 Lab, Anechoic RA		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Victor Type SX-311L	40	1 set	40
Diatone DS-28B	45		45
Lo-D HS-530	53		53
Pioneer CS-F9	40		40
YAMAHA NSL-325	46		46
	(total)		224

Specifications:

- Two-way or three-way system
- With box or other accessories
- Impedance: 4 - 16Ω
- Maximum allowable input: more than 85dB/w
- Frequency range: 100 - 10kHz ±5dB or above
- 1 set (2 speakers) for each maker: total 12 speakers

Remarks:

- With speaker box
- Weight: more 12kg
- With middle and high level controls

7-50 Speaker for hall

Room No. & name of facilities	Db 307 Workshop Radio RA		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
	200	1 set	200

Specifications:

Tall-boy type: more than 4 speakers shall be mounted to a box.

Impedance: 4

Input power: 50W

Bilateral symmetry type 2 speakers a set

7-51 Tuner

Room No. & name of facilities		Db 308 Lab. Anechoic RA		
Name of manufacturer & type for reference		Unit price	Q'ty	Amount
SONY	Type ST-A3	32	3	96
Yagi antenna	Type F-F3C	4	3	12
		(total)		108

Specifications:

1. FM tuner section:

- Sensitivity: less than $1.8\mu\text{V}$ (former-IHF)
- S/N ratio: more than 68dB (in stereo mode)
- S/N 50dB quieting sensitivity:
 - MONO: less than $4\mu\text{V}$
 - STEREO: less than $45\mu\text{V}$
- Effective selectivity rating: more than 75dB (IHF)
- Image rejection: more than 50dB
- Capture ratio: 1.0dB (IHF)
- AM suppression: more than 54 dB
- Stereo separation: more than 45dB (1kHz)
more than 35dB (100Hz - 10kHz)
- Antenna impedance: 75Ω and other
- Output level/impedance: 0 - 1.0V (variable)/ $5k\Omega$ or below

2. AM tuner section:

- Sensitivity: less than $200\mu\text{V/m}$ (1kHz)
- S/N ratio: more than 50dB (50mV/m)
- Selectivity: less than 35dB
- Image rejection: more than 40dB

Accessories:

1. Antenna 3 pcs.
Equivalent to Yagi antenna type F-F3C
2. Coaxial cable: 5C2V 90m

7-52 Exploded demonstration amplifier

Room No. & name of facilities	Db 308 Lab, Anechoic RA		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	100	4	400

Specifications:

The amplifier (same as No. 7-46) shall be exploded and measuring terminals shall be provided at each exploded circuit.

Portable type

Remarks:

Assembled on the each circuit board for students' practice.

7-53 Microphone

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
FOSTEX type M 411	14	17	238

Specifications:

Impedance: 250 - 1k Ω

Frequency characteristics: 50 - 10,000Hz or above

Sensitivity: more than -75dB (0dB = 1V/1 μ bar)

Accessories:

Microphone connection cords 17 pcs.
with standard plug

7-54 Taperecorder

Room No. & name of facilities		—		
Name of manufacturer & type for reference		Unit price	Q'ty	Amount
SONY	Type TC-4660	90	32	2,880
Others	Accessories	-	-	1,226
		(total)		4,106

Specifications:

Tape speed: two (19cm/s, 9.5cm/s) or more
 Wow and flutter: less than 0.1%
 S/N ratio: more than 55dB
 Frequency response: 50 20kHz (at 19cm/s tape speed)
 Output level/load impedance: 0.3 - 1V/10kΩ or above
 Minimum input level/input impedance: LINE: less than 50mV/
 more than 50kΩ
 MIC: less than 0.25mV/
 more than 5kΩ

Distortion factor: less than 2%

Accessories:

1. Dust cover 32
Equivalent to SONY type DP-16
2. Headphone 32
Equivalent to PIONEER type SE-205
Enclosed type
3. Open-reel tape 320
No. 7 size, normal bias, for normal equalizer with reel
4. Microphone 64
Dynamic type, connection cord with standard plug
Equivalent to AIWA type DM-520
5. Portable stand for microphone 32
Thread adjustment: 18 (U 5/16) and 14 (PF 1/2)
Equivalent to SONY type A-16
6. Stereo arm 32
Thread adjustment: 18 (U 5/16) and 14 (PF 1/2)
Equivalent to SONY type SAD-101

Remarks:

AC power source can be used.

With tape counter

No. 7 size reel can be used.

4-track, 2-channel, stereo recording and playback

**3-head system: erasing, recording, playback
with each head terminal**

7-55 Taperecorder

Room No. & name of facilities		—		
Name of manufacturer & type for reference		Unit price	Q'ty	Amount
SONY	Type TC 3000SD	70	6	420
TDK	Type D(C-60)	0.5	30	15
LC Engineering	Cassette test tape	-	16	70
		(total)		505

Specifications:

Cassette stereo taperecorder

Wow and flutter: less than 0.1%

S/N ratio: more than 50dB (at NR Off)

Frequency response: 40Hz - 15,000Hz or above

Output level/minimum load impedance: LINE: 0.3 - 1V/10kΩ

Minimum input level/input impedance: LINE: less than 50mV/more than 50kΩ

MIC: less than 0.25mV/more than 5kΩ

Distortion factor: less than 2%

Headphone with 8Ω impedance can be used.

Accessories:

1. Cassette tape C-60 30 pcs.
2. Cassette test tape 1 for each
 Equivalent to LC Engineering test tape (total: 16 pcs)
 - (1) LCT-301 Tape speed, wow & flutter measurement: 3kHz
 - (2) LCT-302 Frequency response: 31.5 - 10kHz
 - (3) LCT-302CrO₂ Frequency response: 31.5 - 10kHz CrO₂
 - (4) LCT-312-2 Frequency response: 125Hz, 1 and 8kHz
 - (5) LCT-328C Frequency response: 80Hz, 1 and 10kHz
 - (6) LCT-304 Azimuth adjustment: 6.3kHz
 - (7) LCT-313 Azimuth adjustment: 10kHz
 - (8) LCT-305 Distortion factor check: 1kHz
 - (9) LCT-306 Crosstalk: 1kHz
 - (10) LCT-303 Level readjustment: 333Hz
 - (11) LCT-7001 Level readjustment: 400Hz
 - (12) LCT-303B Level readjustment: 1kHz
 - (13) LCT-3003 Level readjustment: 333Hz FULL
 - (14) LCT-901 Reference tape: 12μ
 - (15) LCT-902 Reference tape: 18μ
 - (16) LCT-905 Reference tape: CrO₂
3. AC power source cord 6 pcs.

Remarks:

AC power source can be used.
Cassette type taperecorder
With tape counter and level meter
Three-head type (erase, recording and playback)
With microphone input jack
Portable type
With auto shut-off mechanism
Stereo type
With input volume
Headphone monitoring: possible

7-56 Audio amplifier measuring system

Room No. & name of facilities	Db 306, 307 Lab. Radio RA		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Kimura Electric Works	1,500	30	45,000

Specifications:

Installed on the front of workbench.

Measuring instruments:

1. Low-frequency oscillator: 20Hz - 100kHz or above
2. Change-over switch with resistance attenuator: DC - 200kHz or above, 0.1dB step, 90dB variable
3. Distortion factor meter: 30Hz - 100kHz or above
30 - 0.1% or above
Level meter: 30Hz - 100kHz or above, -60 - 30dBm within ± 0.5 dB
Noise meter: 30Hz - 100kHz or above, 0 - 60dB within ± 1.0 dB
4. Electronic circuit meter: DC, AC voltmeters, ohmmeter, DC ammeter
5. Output meter: 30Hz - 100kHz, load resistance: 2, 4, 8, 16 Ω
Measurement range: 0 - 100W
With indicator
6. DC stabilized power source: ± 0 - 60V, 3A

Accessories:

- Tool set 1 set
- Wiring connector 1 set
- Signal change-over switch 3 sets

Remarks:

For measurement of the basic characteristics of amplifier.

7-57 Acoustic measuring instruments

Room No. & name of facilities	Db 308 Lab. Anechoic RA		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
ONSOKU	1,280	12	15,360

Specifications:

Installed on the movable measuring rack.

Frequency range: 30 - 30kHz or above

Measuring instruments:

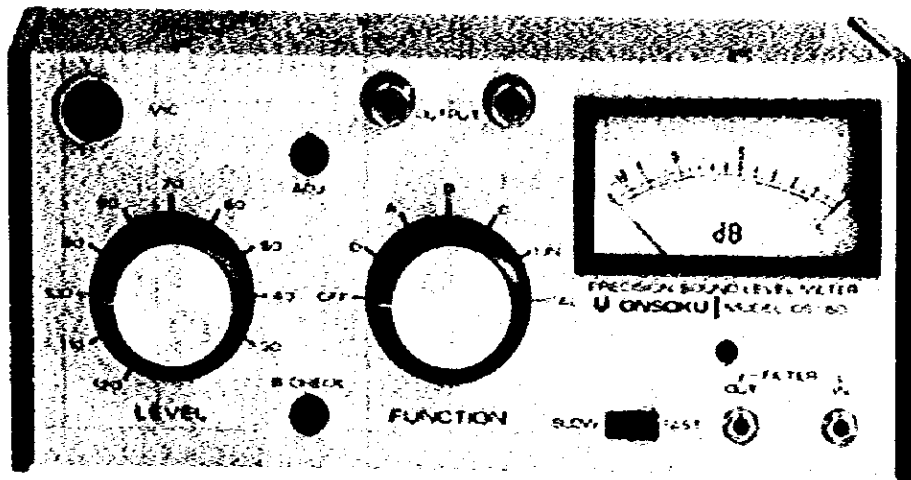
1. Sound level meter:
Range: 45dB - 140dB
With condenser type 1/2" microphone
With level adjuster
2. Sine random generator: with 50W output
for generating sine wave, white noise,
and pink noise
3. Universal recording meter: oscillation level recording
0.5V - 10V rms (full-scale) ± 0.5 dB
4. Sweep oscillation adapter: sweep mechanism of oscillator
which can be synchronized with
recording paper

By using the above measuring instruments, this apparatus can record the characteristics of audio devices by automatic sweeping mechanism.

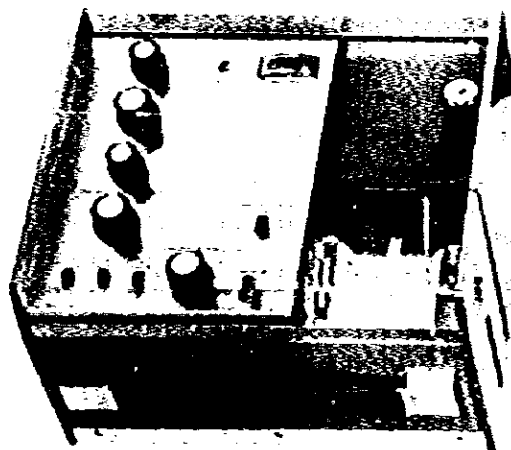
Remarks:

For measuring the characteristics of audio devices including speakers.

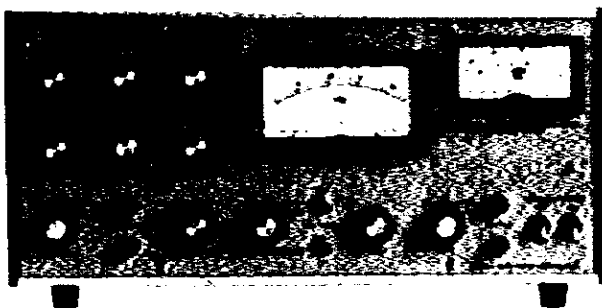
o Sound level meter



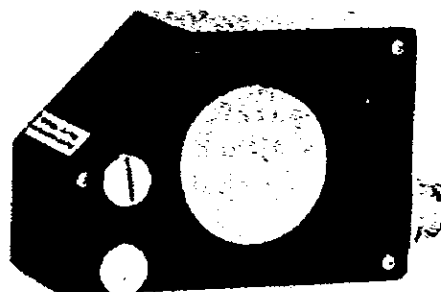
o Universal recording meter



o Sine random generator



o Sweep oscillation adaptor



7-58 Measuring instruments for anechoic room

Room No. & name of facilities	Db 308 Lab. Anechoic RA		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
ONSOKU Combination set	1,400	1	1,400

Specifications:

Consists of the following measuring instruments:

1. Sine random generator: with 50W output amplifier
sine wave, white noise and pink noise generation
2. 1/3 octave analyser: fitted standard IEC-R-225
analysis level 60dB 2 sets
3. Automatic sweep adapter: automatic device of the above filter
for synchronization..... 2 sets
4. Speaker (with a box): maximum input 20W
8Ω , 93dB/W
5. Microphone: 1/2" condenser type 20Hz - 38kHz or above
6. Precision sound level meter: 45dB - 140dB, 10 step, 9 ranges
7. Universal high-speed recording meter
8. Sound meter (with record) : 40 - 110dB, with electret condenser
microphone

Frequency response of the above instruments: 20Hz - 30kHz or above

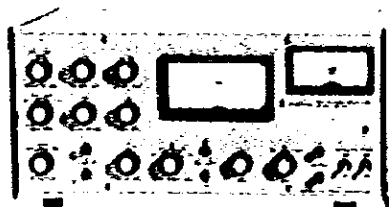
Can measure and record easily the audio characteristics of speakers and microphones.

This apparatus is fixed type, so all of the measuring cords and cables shall be attached. In addition, recording paper and all of the related stationery shall be attached.

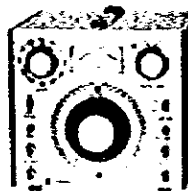
Accessories:

1. Case, holder, cables, attached amplifier and cords 1 set
2. Recording paper: 100 sheets x 5
3. Input/output cords 1 for each
4. AC adapter 1

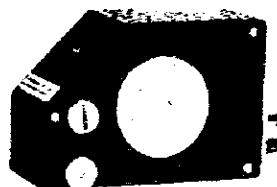
o Sine random generator



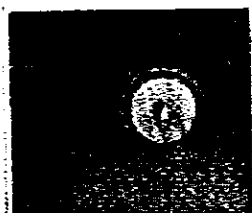
o 1/3 octave analyser



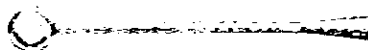
o Automatic sweep adapter



o Speaker

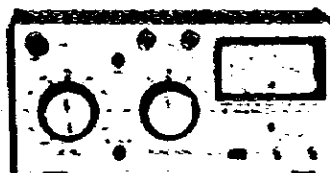
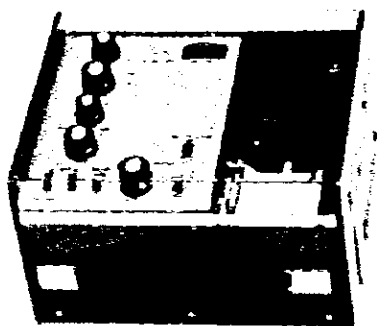


o Microphone and
Precision sound level meter



OMC-6531

o Universal high-speed
recording meter



o Sound meter (with record)



7-59 Amplifier characteristics display recorder

Room No. & name of facilities	---		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Meguro Denpa Sokki Low-frequency response tracer type MAT-141A	1,000	1	1,000

Specifications:

Can indicate the characteristics on the cathode ray tube for direct viewing.

Vertical axis amplifier: logarithmic amplification of 5/25/50 dB, 0dB = 10mV

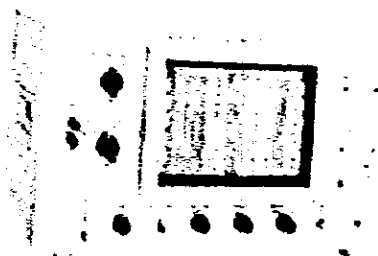
Frequency response: 20Hz - 20kHz
 5dB range ± 0.25 dB
 50dB range ± 1 dB

By the adoption of frequency automatic tuning circuit, external synchronization signal is not required for the horizontal axis.

Have data recording terminals of X-Y recorder.

Remarks:

For simple direct observation of the frequency response of audio devices.



7-60 Player characteristics measuring instrument

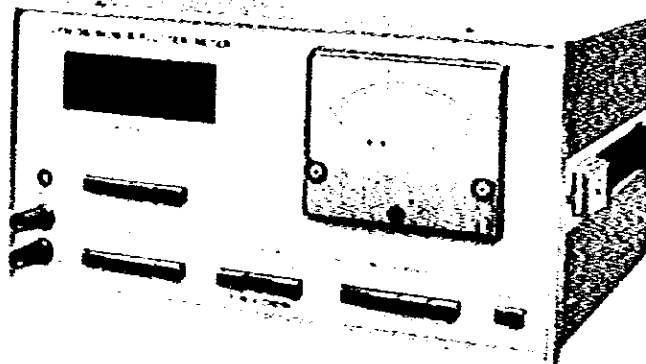
Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
LEADER Wow and flutter meter type LFM-38	240	12	2,880

Specifications:

Wow and flutter meter: can measure the wow and flutter of tape recorders and record players and the rotational speed of record players.

Frequency response measuring instrument: for measuring the characteristics of record players by using frequency response recorded on a record (frequency response, trace ability, channel separation, etc.)

Can measure stereo characteristics of record players.



7-61 Level meter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	300	2	600

Specifications:

Same as No. 5-46

7-62 Frequency analyzer

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	1,000	2	2,000

Specifications:

Same as No. 5-53

7-63 Distortion factor meter

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	300	4	1,200

Specifications:

Same as No. 5-46

7-64 Low-frequency generator

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	170	4	680

Specifications:

Same as No. 3-37

7-65 Speccil waveform generator

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	400	2	800

Specifications:

Same as No. 4-61

7-66 Constant-voltage unit

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	50	10	500

Specifications:

Same as No. 3-46

7-67 Eliminator power unit

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	250	5	1,250

Specifications:

Same as No. 3-47

7-68 Workbench

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Workbench	-	111	3,910
Chairs	5	80	400
	(total)		4,310

Specifications:

Worktable for teachers 2 sets x 100,000 = 200,000 yen

Same as No. 2-32:

Dimension:

1,000 x 500 16 sets x 30,000 = 480,000 yen

1,500 x 500 1 set x 30,000 = 30,000 yen

1,000 x 750 60 sets x 35,000 = 2,100,000 yen

750 x 750 30 sets x 30,000 = 900,000 yen

1,800 x 760 2 sets x 100,000 = 200,000 yen

(total) 79 sets 2,610,000 yen

Chairs 80 sets x 5,000 = 400,000 yen

7-69 Locker

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	60	20	1,200

Specifications:

Same as No. 2-33

7-70-1 Copier

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	400	2	800

Specifications:

Same as No. 1-4

7-70-2 Overhead projector

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	150	2	300

Specifications:

Same as No. 1-11

7-70-3 Automatic slide projector

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	120	2	240

Specifications:

Same as No. 2-35-3

7-70-4 Movie projector

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	750	2	1,500

Specifications:

Same as No. 1-12

7-70-5 Amplifier for lecture

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	150	2	300

Specifications:

Same as No. 1-8

7-70-6 Taperecorder

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Taperecorder	60	2	120
Cassette tape	0.5	60	30
Others	15	2	30
	(total)		180

Specifications:

Same as No. 3-57

Accessories:

1. Oil 3 for each
Equivalent to SONY type OL1KA (total: 6 pcs.)
and OL2KA
2. Cleaning liquid for head and rubber 10 for each
Equivalent to SONY type KK-2 (total: 20 pcs.)
3. Cassette tape (C-60) 60
Equivalent to TDK D type (C-60)
4. AC power source cord 2

7-70-7 VTR unit

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	1,000	2	2,000

Specifications:

Same as No. 1-15

7-71 Wires

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	6	180	1,080

Specifications:

Same as No. 3-59

7-72 Parts

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	10	180	1,800

Specifications:

A set of L, C and R for the practice of radio engineering

Radio parts

Plastic case for radio set

Screws, nuts, washers, etc.

Remarks:

A set of parts for the assembly, repair, and maintenance of radio sets, including small articles.

7-73 Tool set

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	45	100	4,500

Specifications:

Same as No. 3-16

7-74 Tools for preparatory work

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	50	5	250

Specifications:

Same as No. 2-39

