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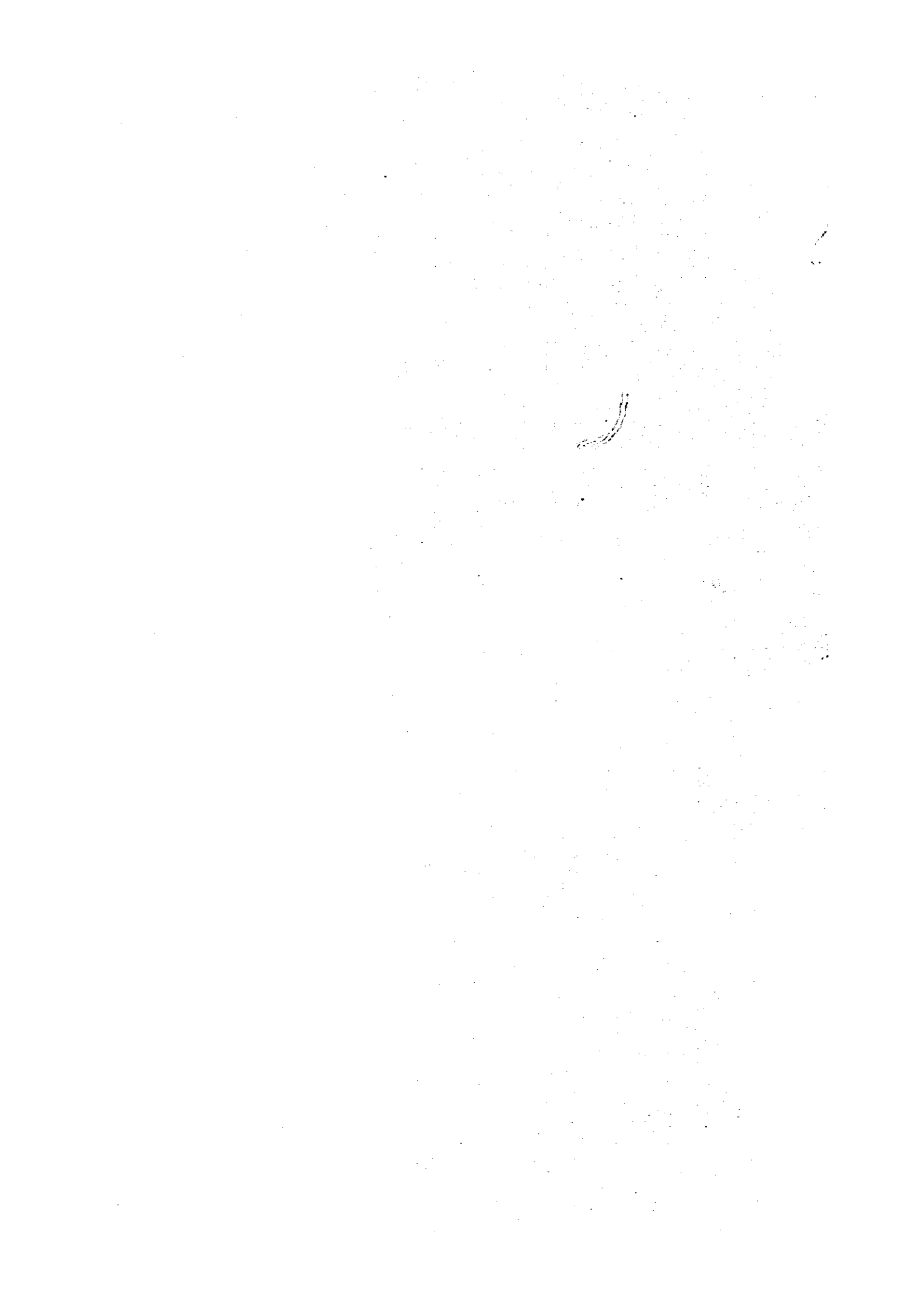
マイクロ  
フィルム作成

## 1. Drawing

Cost of equipment :

price Thousand Yen : 35,274

price US \$ : 180,892



**1-1 Universal drafting machine**

Room No. & name of facilities	Dc 203, 204 Drafting DR Dd 204, 205		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Muto Industry Drafter KTH-6	72	120	8,640
Side table	26	120	3,120
Chair	16	120	1,920
	Total:		13,680

**Specifications:**

A drawing board: for A1 size

Index: 15° whole circle division type, automatic lock-up

Protracting board graduation: whole circle, minimum division 1°

Minute angle reading: vernier system, minimum reading - 10 minutes

Inclination of drawing board: 0° - 80°

Drawing stand: with side cabinet, with drawer

Chair: A chair for exclusive use with a foot rest

Magnade used: with 10 sheets of drafting plate

Drafter lead sharpener

Template

Drawing instrument set consisting of 7 pieces

Sharp pencil: a set of 4 pencils (0.2, 0.4, 0.6, 0.8 mm)

A set of square

**Remarks:**

A drawing stand of A1 size with a side table and a chair.

A complete set of a drawing instrument shall be included.

All of the students should be able to draw at the same time.

**1-2 Universal drafting machine**

Room No. & name of facilities	Dc 202, 205 Preparation DR Dd 203, 206		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Muto Industry Drafter ETZ-9	190	4	760

**Specifications:**

- A drawing board: for A0, magnade type
- Drafter: index 15° whole circle division type, automatic lock-up
- Protracting board graduation: whole circle, minimum division 1°
- Minute angle reading: vernier system, minimum reading - 10 minutes
- Inclination of drawing board: 0° - 80°
- Drawing stand: height and angle are adjustable; one-touch
- Chair: A chair for exclusive use with a foot rest
- Side table with a drawer

- Accessories:**
- Magnade used: with 10 sheets of drafting plate
  - Drafter lead sharpener
  - Template
  - Drawing instrument set consisting of 12 pieces
  - Sharp pencil: a set of 3 pencils for drawing

**Remarks:**

Same as No. 1-1 but to be used by teachers in a preparatory room.



**1-3 Drawing printer**

Room No. & name of facilities	Dc 202, 205 Dd 203, 206 Preparation DR		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Ricoh	600	4	2,400

**Specifications:**

**Electronic positive copying machine**

**Printing of a drawing of A1 size or larger can be made .**

**To be printed in positive**

**Easy handling and maintenance**

**Avoid use of liquid as far as possible**

**A machine with special consideration for maintenance, for it is to be used for drawings of a large size.**

**Remarks:**

**Minimum use of liquid to suit the use in the hot country**

**Easy handling and maintenance**

**Copies for drawing shall be produced in positive .**

**Copies of drawing of a large size can be made .**

**Easy maintenance to suit infrequent use**

**1-4 Copier**

<b>Room No. &amp; name of facilities</b>	<b>Dc 202, 205 Dd 203, 206</b>	<b>Preparation DR</b>		
<b>Name of manufacturer &amp; type for reference</b>	<b>Unit price</b>	<b>Q'ty</b>	<b>Amount</b>	
<b>Ricoh</b>	<b>400</b>	<b>4</b>	<b>1,600</b>	

**Specifications:**

**Electron dry copier**

**Maximum B4 positive printer**

**This copier is easy to handle and maintain.**

**No special paper shall not be used.**

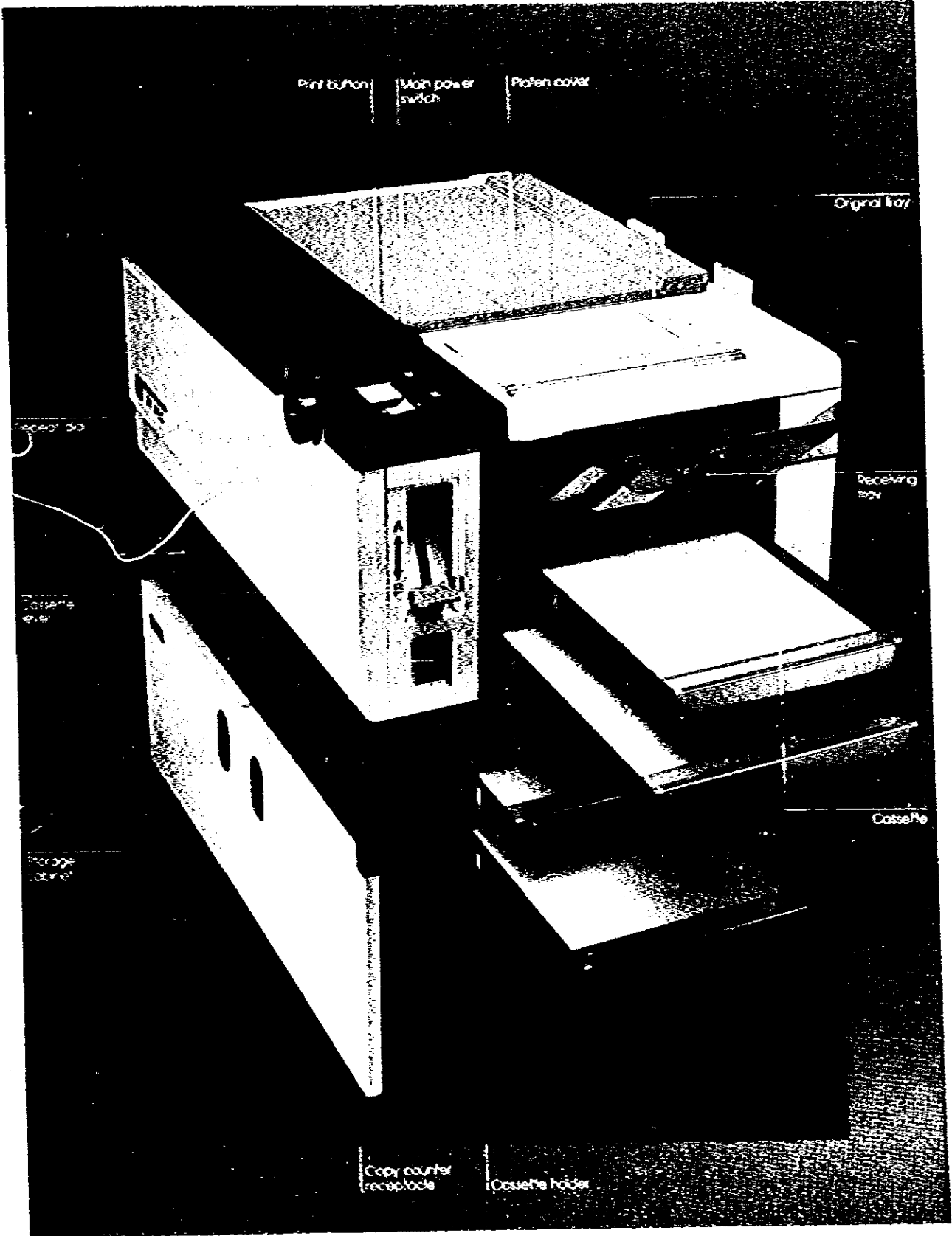
**Accessories:**

- 1. Articles of consumption: 1 set**
- 2. Maintenance parts and tools: 1 set**
- 3. Paper a package of 1,000 sheets x 10**

**Special consideration shall be taken with regard to the maintenance.**

**Remarks:**

**A copy of the drawing designed by a dry copier can be made easily.  
The copiers are selected from the products made by the same company and consideration must be taken with regard to the maintenance.**



**1-5 Cutter**

Room No. & name of facilities	Dc 202, 205 Preparation DR Dd 203, 206		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	30	6	180

**Specifications:**

**A1 paper cutter**

**Paper holding mechanism can be operated easily by hand.**

**This cutter shall be able to cut many sheets of paper holded at a time.**

**This cutter shall be able to cut the paper of A5 or below.**

**This edge can be honed simply. Consideration must be taken to safety.**

**Remarks:**

**Cutter shall be able to cut a A1 paper .**

**The cutting method is that the cutting shall apply in parallel to a paper.**

**1-6 Desk-top calculator**

Room No. & name of facilities				
Name of manufacturer & type for reference	Unit price	Q'ty	Amount	
Casio calculator      Personal M-1	4	60	240	
AC adapter AD-25	2	60	120	
	<b>Total:</b>		<b>360</b>	

**Specifications:**

This calculator shall be equipped with the function as follows:  
 aggregation memory, reduction and multiplication,  $\sqrt{\quad}$  function,  
 arithmetic function.

**Accessories:**

1. AC adapter AD-25: 1 each
2. Cell (um. 3): 12

**Remarks:**

A small pocket type table calculator.

**1-7 Sketching tablet**

Room No. & name of facilities	Dc 206, Dd 207 Sketch DR		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Uchida Yoko US-505 3-6128	30	16	480

**Specifications:**

- A sketching desk for personal use
- Dimension: 1,000 x 1,000 x 700 - 900 H
- Made of steel with meramin dressed top
- Sketching pencils set of 5 pieces
- Sketching paper: B4 size, 1,000 sheet bundle x 3

**Remarks:**

A sketching desk for drawing which is easy to move and hard to scratch.

**1-8 Speaker system**

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

**Specifications:**

**The Uses in the classroom: wireless microphone and loudspeaker**

**1. Wireless microphone: 2, use 2 frequencies**

**2. Loudspeaker: 3W at minimum, 2  
attached with a cassette tape recorder  
a large radio-attached radio cassette**

**Accessories:**

**Power source cord, earphone, A cell (UM-1) can be used.**

**The reach of the voice of the wireless microphone is limited to the range within a class, so that the voice can not be heard outside.**

**Remarks:**

**This speaker system shall be used for the lecture in a classroom and can use a wireless microphone.**

1-9 Locker

Room No. & name of facilities	Dc 202, 205 Dd 203, 206 Preparation DR		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Uchida Yoko      Map master for A1	100	12	1,200

**Specifications:**

**For arranging drawings of A1 size, 10 drawers**

**To be able to arrange and store drawings of A1, half A1 of quarter A1 size**

**Shall have a mechanism to hold down drawings**

**Four (4) stands of A1 size shall be attached.**

**Remarks:**

**A locker for storing drawings**



1-10 Locker

Room No. & name of facilities	Dc 202, 205 Preparation DR Dd 203, 206		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Uchida Yoko Instrument cabinet SK-S1W	60	18	1,080

**Specifications:**

- A locker for instruments or specimens
- Glass door on both sides of upper half with 3 shelves
- Glass door on one side of lower half with 3 shelves
- Attach a stopper against sliding for combination of the upper and lower halves
- 1,760 W x 400 D x 880 H (mm)
- Upper & lower shelves (1 set)
- A metal locker of standard shape will do.

**Remarks:**

For storing instruments or specimens

**1-11 Overhead projector**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Uchida Yoko      Type IP- Wide 51	150	6	900

**Specifications:**

Attached with the projector base

1. Usable material area      250 x 250
2. Projection lense      f = 285 mm, composition of 2 sheets
3. Condensor lense      flennel lense      - ditto -
4. Projection lense      specified at site      600 W harogen
5. Magnifying power      6.1 x
6. Angle of projection      Maximum angle: 25°
7. Head: can revolve in the direction of 360°

With extinction switch and close up lense

Power source: AC220 V, 60 Hz

**Accessories:**

1. Spare lump: 3
2. Roll carrier for OHP
3. Roll film: 10
4. TP pen      water: 10, six a set  
                 oilness: 10, six a set
5. TP making material set (with case);
 

Color tape	Clear film (Lumirror)
Tenplate	Color sheet
Film (ruled into 5 mm squares)	White map
Scissors	Ruler
Film (for Roman letters)	TP underlay

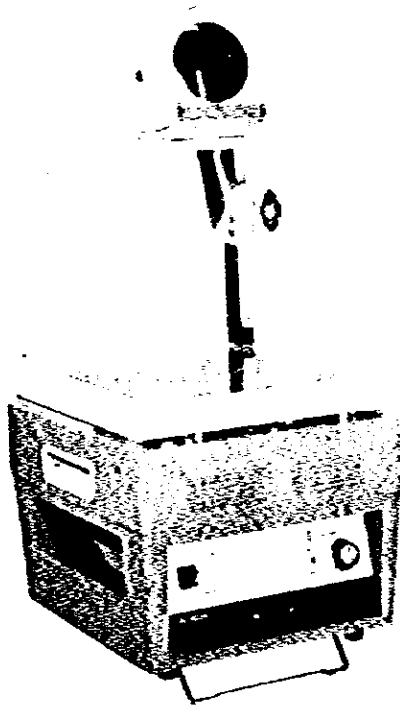
Lettering

Indication rod

Electing rotary disc

**Remarks:**

1. This is easy to use in a classroom
2. It shall be attached with a complete set of OHP sheet drawing instruments .
3. With TP drawer and film for constructing the materials .



**1-12 Movie projector**

Room No. & name of facilities			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Hokushin Electric      Type X-350	750	2	1,500

**Specifications:**

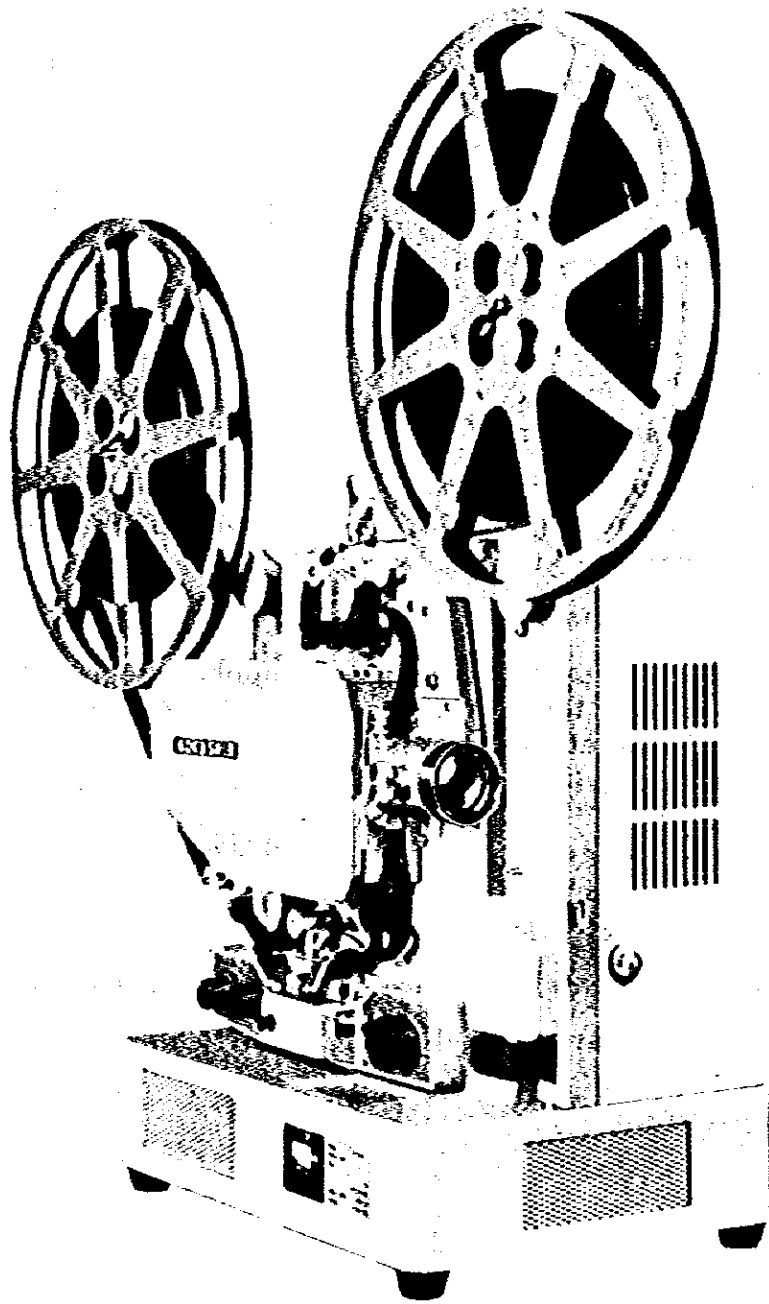
- 16 mm projector
- Play-back method: optical and magnetic
- Light source: 350 W xenon lamp
- Projection lense:
  - F: 1.2 f50m/m large aperture lense for cinemascope
- Projection speed: 24 frames
- Rewinding: high speed automatic
- Reversal projection: possible
- Film reel capacity: max. 600 mm
- Changeover: possible
- Power source: AC 220V, 60 Hz

**Accessories:**

350 W xenon lamp ..... 3pcs.

**Remarks:**

16mm projector convenient as an audiovisual material.



**1-13 Device model**

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

**Specifications:**

**Drawing specimen**

**1. Machinery specimen:**

gear pump, clutch, coupling, dial mechanism, spanner, bearing, packing weight, ball bearing, bolts and nuts (10 sets), various kinds of wheels

**2. Electrical specimen:**

switch, knife switch, insulator, socket electric bulb, outlet, knob, table tap, various kinds of electric wire, a set of insulating materials  
 others: electric parts, a set of the parts for communication apparatus

**Remarks:**

Specimens of fundamental parts for machines and the parts for communication apparatus in a drawing room.

**1-7-1 Chair, w/drawing board**

Room No. & name of facilities	Dc 206, Dd 207 Sketch DR		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	6	64	384

**Specifications:**

**Chair for students:**

A round chair of height-regulation type  
To be sturdy enough for use by students

**Drawing board:**

A standard neck-hanging drawing board  
Made of card board, light enough to be hung from shoulder

**Remarks:**

A chair and a sketching board for sketching room

**1-14 TV receiver**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	150	6	900

**Specifications:**

**A large-sized colour television receiver of 26-inch type or above shall be used in combination with VTR system.**

**Colour system: specified in situ  
SECAM system**

**The receiver shall be able to receive the screen from a cassette tape reader (VTR) and Teaching material center (No. 12)**

**Remarks:**

**Installed one by one in the classroom for the audio-visual education.**



Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
SONY	1,000	6	6,000

**Specifications:**

Colour television monitor of 26-inch type or above..... 2 sets

Video cassette recorder ..... 1

Colour system: specified in situ

RF converter shall be attached.

Fittings: with a cable

Television set stand: the lower part can be used for cassette tape case.

**Accessories:**

1. Cassette tape ..... 10 pcs.

2. Recorded cassette tape ... 10  
(basic drawing series)

**Remarks:**

For audio-visual materials in a classroom

The receivers shall be located near the blackboard and at the middle side of the classroom.

Cassette tape source: manufactured in the Teaching Material Center and supplied in general market.

**1-16 Kent paper**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	3	100 Packages	300

**Specifications:**

**Drafting paper (kent paper)**

**Size:**

- A1 ..... 20 x one package (1,000 sheets)
- A2 . ..... 50 x one package (1,000 sheets)
- B3 .... 30 x one package (1,000 sheets)
- Graph paper A2 ..... 5,000 sheets
- Graph paper A3 .. ..... 5,000 sheets

**Remarks:**

**Shall be used for half-size by cutter.**

**1-17 Pencils and other consumables**

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

**Specifications:**

**(Total)**

Pencil: HB, H, 2H, B, 2B (1,000 for each) .....	5,000 pcs.
Rubber and sand erasers: .....	1,100 pcs.
Erasing plate ... . . . . .	130 pcs.
Lead for ever-sharp pencil	
0.2 mm, 0.4 mm, 0.6 mm, 0.8 mm HB .....	100
Triangle (a set of large size) .....	130 sets
French curve (a set of middle size) .....	130 sets
Drawing tape .....	1,000 pcs.
Template: letter, circle, ellipse, hexagon for communication and information .....	130 sets
Black pen and ink for drawing .....	130 sets
Hairbrush .....	130 pcs.
Electric pencil sharpner .....	10 pcs.

**Remarks:**

A set of articles of consumption for drawing.

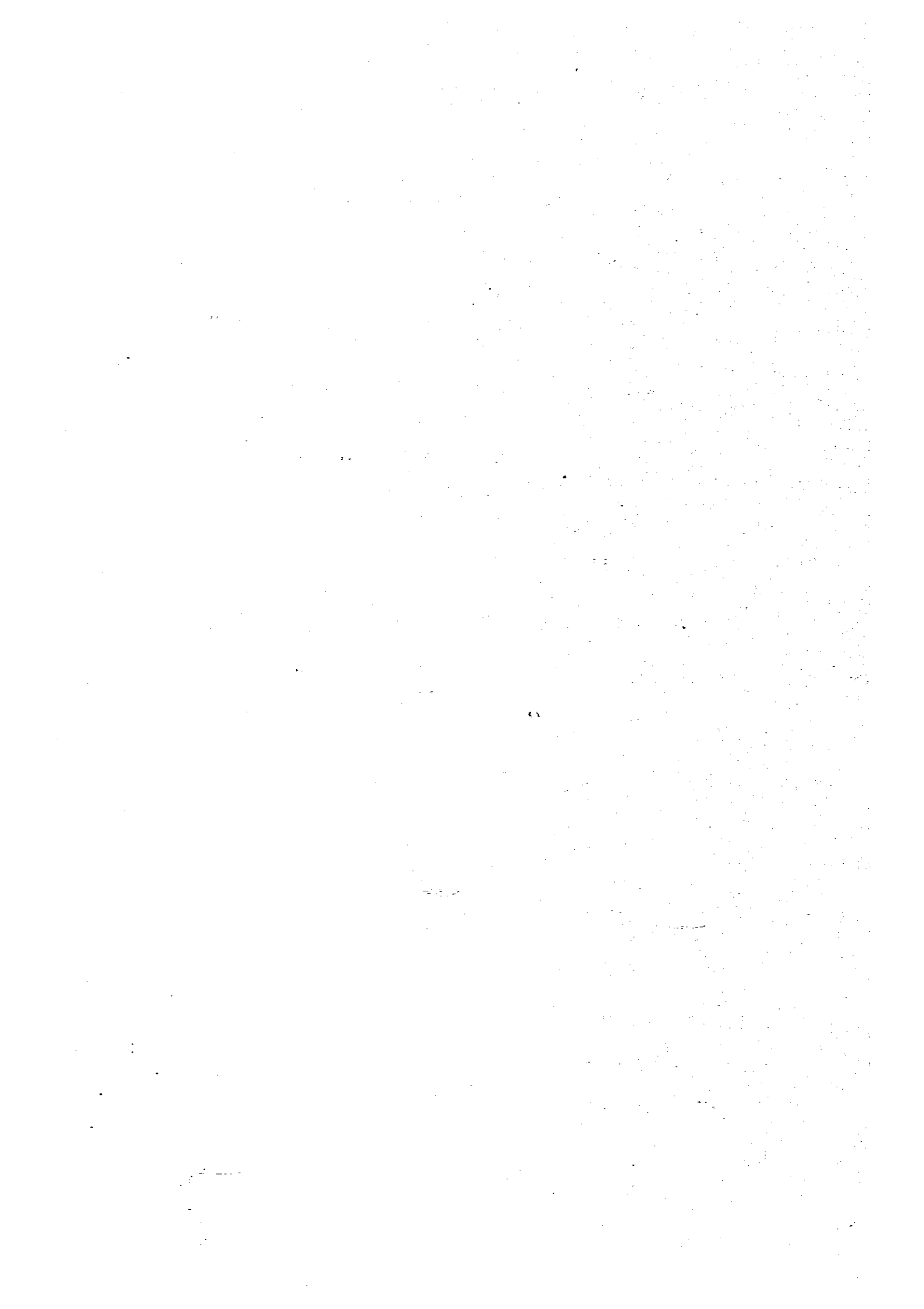


## 2. Workmanship I

Cost of equipment :

price Thousand Yen : 94,395

price US \$ : 484,077



2-1-1 Bench lathe

Room No. & name of facilities	Da 104 Workshop Machinery-1 WI		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Kitamura Machine Works KL-20 type precision bench lathe	650	3	1,950

**Specifications:**

Swing over bed: 230 m/m

Swing over cross slide: 148 m/m

Distance between centers: 290 m/m

Collet caliber: 20 m/m

Spindle speeds

Number of speeds: 6

Rotating speed (rpm 50Hz): 800 - 2,600

Longitudinal slide travel

Front feed bed: 60 m/m

Rack feed bed: 60 m/m

Cross slide travel: 90 m/m

Diameter of tail spindle: 24 m/m

Tapered hole of tail spindle: MT No. 1

Tail spindle travel: 65 m/m

Bed length: 700 m/m

Bed width: 95 m/m

Motor: 220V, 0.75 kw, 4p

Height of machine: 1,100 m/m

Power source: AC380V, 60Hz, 3 phase

Accessories: 4" flange, standard set of accessories, scroll chuck 4", standard cutting tool 3 sets, cutting oil - one can, rag - one bundle, consumables - one set

**Remarks:**

Floor space required: 850 x 430 m/m

Cutting oil: 1 can

Rag: 1 bundle

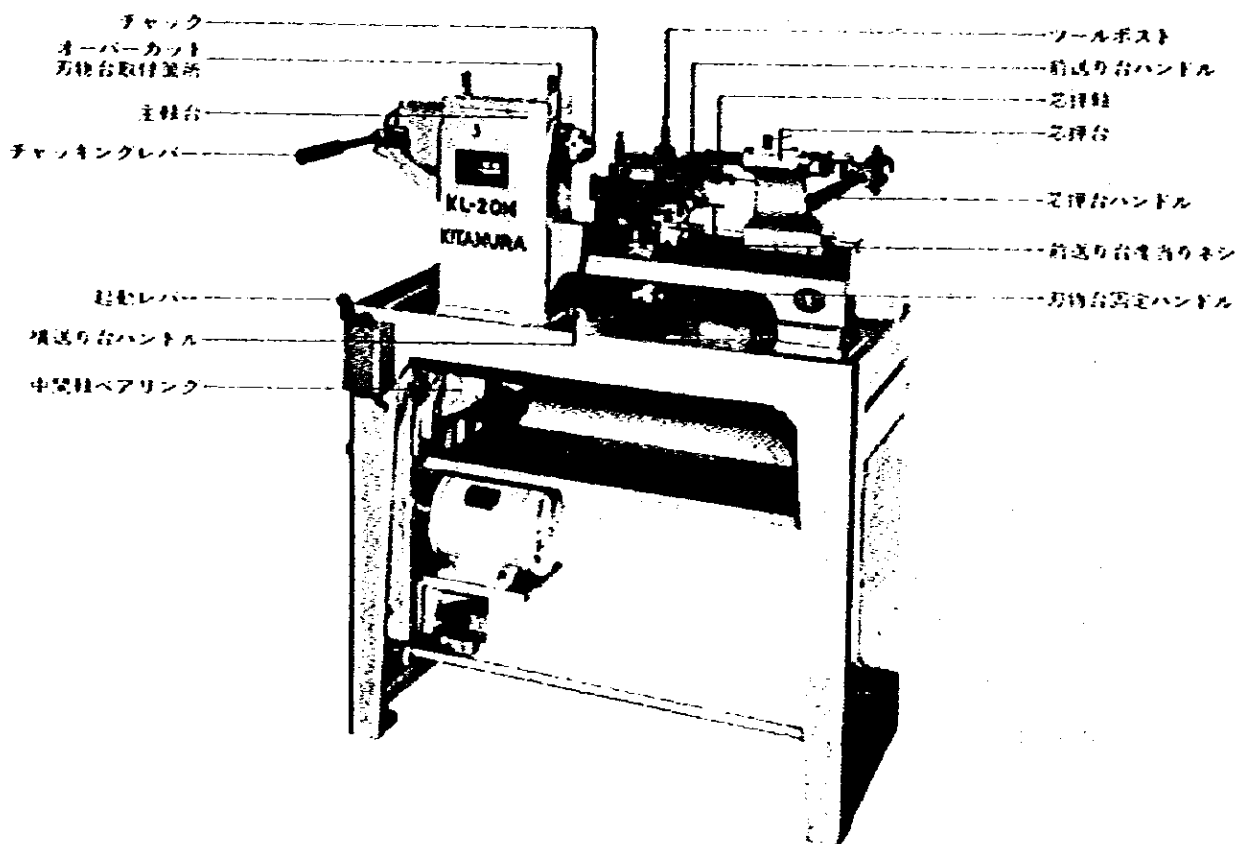
Consumables: 1 set

Remarks:

1. Floor space required: 2,400 x 1,400 m/m

2. Motor required: 3.7 kW or 2.2 kW 4p

Lathe for precision machining; should be sturdy enough to be used by students' practice, and have working capacity for machining exercise material at school.





**2-1-2 Bench lathe**

Room No. & name of facilities	Da 104 Workshop Machinery-1 WI		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Washino Machine Tool Precision lathe LR 55A type	1,500	3	4,500

**Specifications:**

**1. Normal size**

Swing over bed: 360 m/m

Swing over cross slide: 210 m/m

Distance between centers: 550 m/m

**2. Spindle**

Taper hole of spindle: MT No. 5

Hole through spindle: 30 m/m

Spindle center: MT No. 3

Range of spindle speeds: 83 - 1,800 and 70 - 1,500 rpm

**3. Tailstock**

Taper of center: MT No. 4

**4. Bed**

Length x width: 1,350 x 275 m/m

**5. Carrage**

Travel of saddle: 525 m/m

Travel of cross slide: 220 m/m

Travel of tool slide: 100 m/m

**6. Feeds**

Range of longitudinal and cross feeds: 0.04 - 0.61 m/m

**7. Threads**

Range of threads: metric threads - 0.5 - 7 m/m

Inch threads - 56 - 4 t.p.i.

**8. Motor out put**

Main spindle motor: 3.7 (2.2) kW, 4p

9. Power source: AC380V, 60Hz

3-phase

10. Accessories

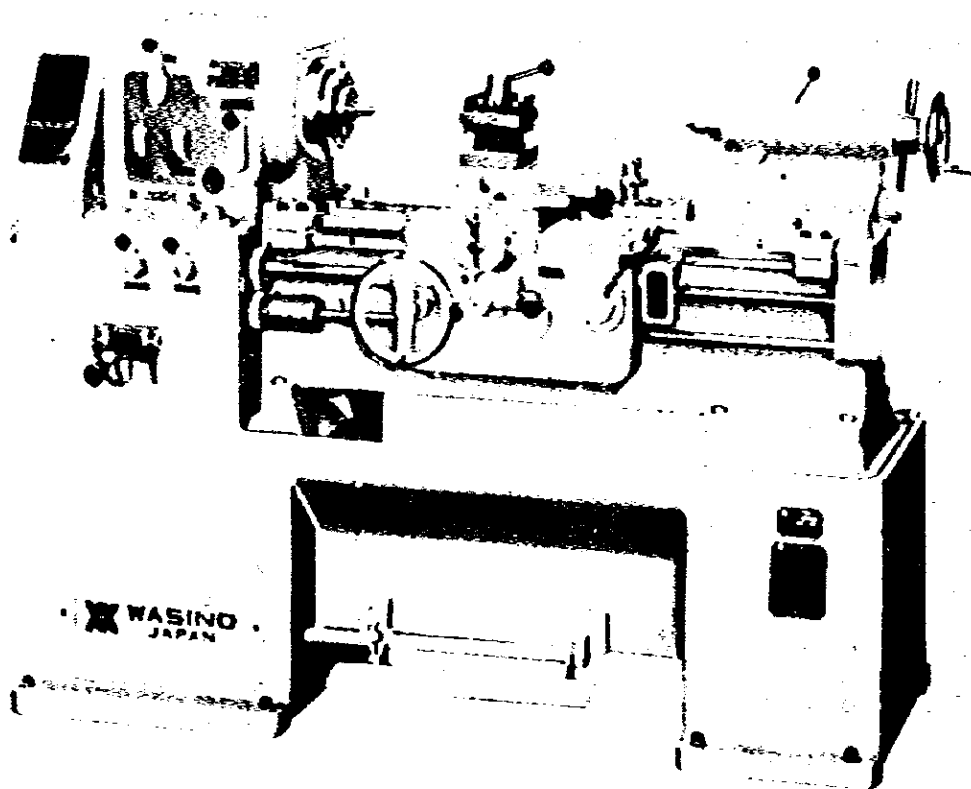
Standard cutting tool: 3 sets

Weight: 230 kg

Remarks:

Should be sturdy enough to be used by students's practice, small and precise, and have working capacity sufficient for machining exercise material.

Can be used in combination with No. 2-1-2



2-2 Bench drill press

Room No. & name of facilities	Da 107 Workshop Sheet Metal Da 101 Workshop Machinery-2 Db 110 Workshop Wiring		WI WI WI
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Namiki Machine MFG. Bench  Bench drilling machine NBD-340AF	180	20	3,600

Specifications:

Drilling Capacity: (cast iron) 13 $\phi$  (steel) 10 $\phi$   
 Swing: 340 m/m  
 Spindle speeds: 50Hz - 450, 1,000, 1,800, 3,200  
 (rpm) 60Hz - 540, 1,200, 2,160, 3,840  
 Automatic feed: mm/rev 0.09, 0.15, 0.2 m/m rotation  
 Feed travel: manual - 90 Automatic - 90  
 Working surface of table: 254 x 254 m/m  
 Working surface of base: 182 x 220 m/m  
 Spindle Taper: J.T. No. 2 1/2  
 Max. distance chuck to table: 350, 300 m/m  
 Max. distance chuck to base: 490, 440 m/m  
 Diameter of column: 80 $\phi$   
 Power source: AC 380V, 60Hz, 3 phase

Accessories:

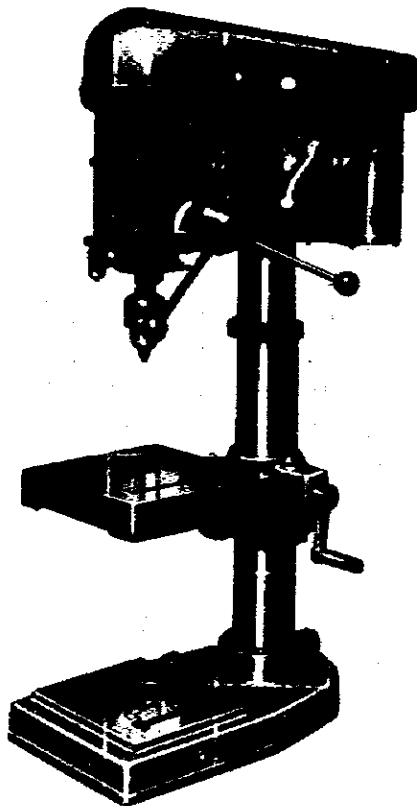
Drills for metal with stand: 2 sets  
 Drills for wood: a set of 12 pieces  
 Cutting Oil: 1 can

Remarks:

Motor: 300W 4P  
 A bench drilling machine capable of drilling steel plate,  
 aluminum plate and wood, including a set of drills and consumables.

**Remarks:**

**Space required: 1,980 x 1,885 x 1,450H**  
**Should be suitable for exercise of basic machining, and including a set of consumables for exercise.**



## 2-3 Milling Machine

Room No. & name of facilities	Da 104 Workshop Machinery-1 WI		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Enshu Seisaku HA-A type, autocycle	2,250	1	2,250
HA type	4,500	1	4,500
VA type	4,500	1	4,500
	(Total)		11,250

### Specifications:

#### 1. Table

Max. longitudinal travel: 200 m/m  
 Max. cross travel: 560 m/m  
 Max. vertical travel: 400 m/m  
 Working surface: 1,100 x 260 m/m  
 T slots, number - width x spacing: 3 x 16 x 60  
 Feeds: cross 35 - 1250  
 Power rapid traverses: cross 2700

#### 2. Spindle

Spindle nose: N.S.T. No. 40  
 Number of speeds: 12  
 Speeds: 67 - 2240 or 36 - 1205 rpm  
 Distance from the center of spindle to the table surface: Max. 400  
 Distance from the center line of spindle to the bottom surface of overarm: 135  
 Distance from the end of spindle to the top of table (vertical): 400  
 Distance from the center line of spindle to the column (vertical): 270

#### 3. Motors

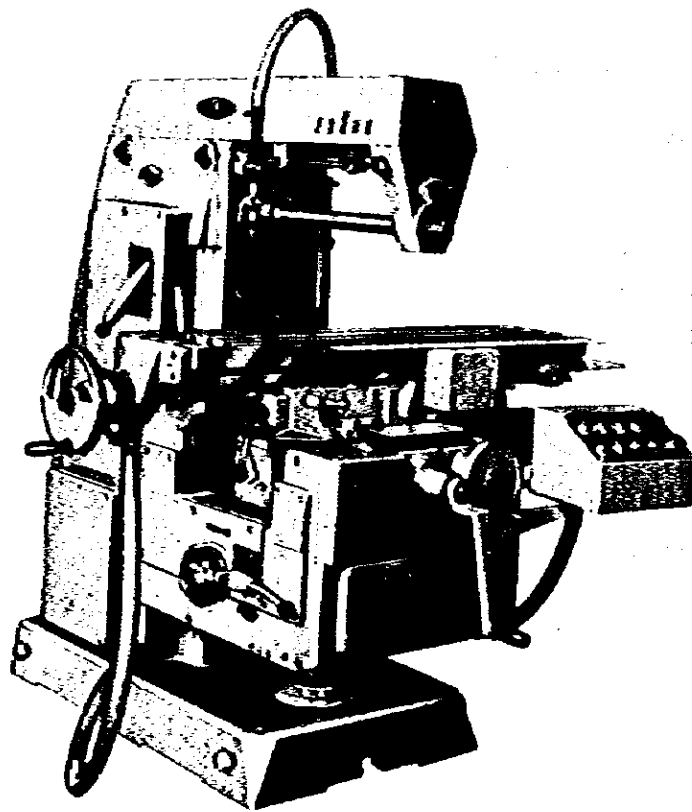
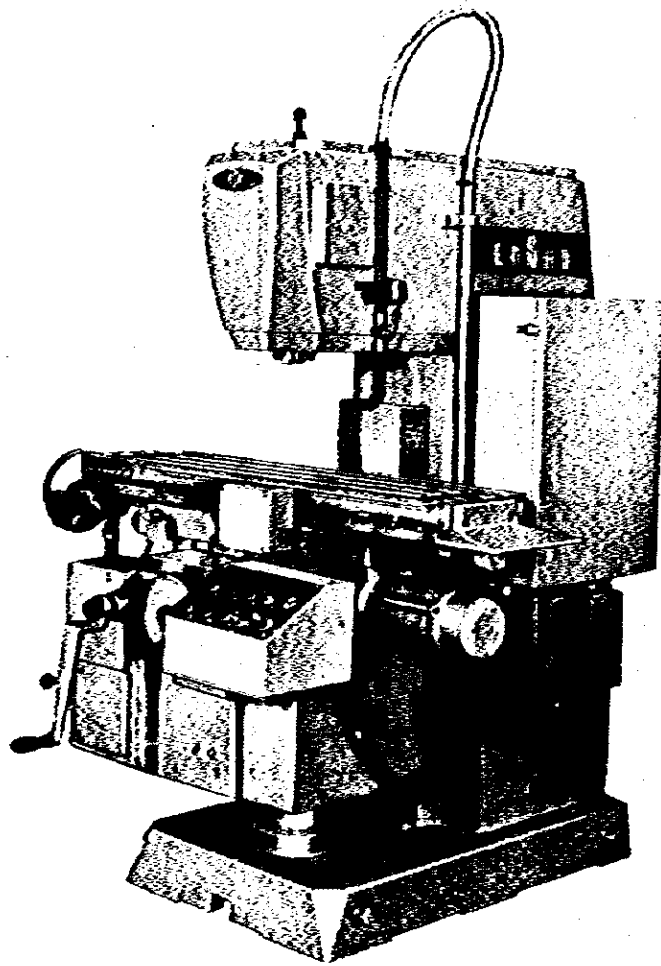
Spindle drive 2.2kW  
 Feed and rapid traverse drive 0.4kW  
 Coolant pump drive 600W

Full automatic cross feed of table

Similar to plain milling machine in other respects

### Accessories:

3 sets of standard cutting tools  
 A can of cutting oil  
 A bundle of rag  
 Other consumables, A set of standard accessories



**2-4-1 Tool Grinder**

Room No. & name of facilities	Da 101 Workshop Machinery-2 WI		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Uozu Machine Mfg. UD-323 type, drill pointer	360	1	360

**Specifications:**

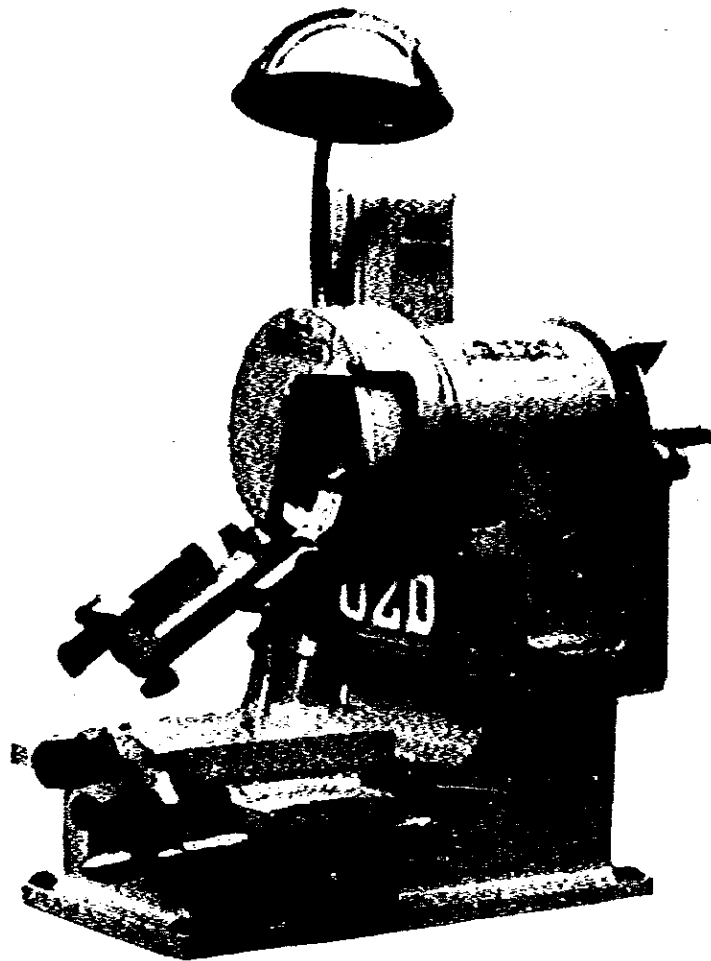
**Use:** grinding of relief angle face on a right-hand twisted drill  
**Grinding method:** conical grinding method  
**Drill diameter:** 3 - 23 m/m (straight shank drill and taper shank drill)  
**Point angle:** 90° - 150°  
**Relief angle:** 10° standard, manually adjustable  
**Grinding wheel:** Cup wheel 150  $\phi$  x 45 x 50  $\phi$  x 12 x 12 DA-54-J  
**Motor:** 380V, 2P, 3 phases 0.2kW 50Hz 2,840 rpm  
**Floor space x Height:** 435 x 220 x 530 m/m  
**Power Source:** AC380V, 60 Hz, 3-phase

**Accessories:**

Spare grinder 1 set  
 Consumables 1 set  
 Standard 1 set  
 Extra accessories 1 set

**Remarks:**

**Floor space x height required:** 340 x 455 x 580 m/m  
**Weight:** 183 kg  
 To be used as the grinder for drills and easily handled by students and laymen.





**2-4-2 Tool Grinder - Bench Grinder -**

Room No. & name of facilities	Da 104 Workshop Machinery-1 WI		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	50	4	200

**Specifications:**

**A duplex grinder - 400W**

**Accessories:**

**Grindstone - 2 sets, for grinding cutters for lathe  
Stand for installation**

**Power source: AC 380V, 60Hz, 3-phase**

**Remarks:**

**A cutter grinder for grinding cutting tools of lathe, etc.**

2-5 Surface plate

Room No. & name of facilities	Da 101 Workshop Machinery-2 WI		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Uchida Yoko      Type H-40	20	10	200

**Specifications:**

Surface plate of 30 x 40 cm or above

**Remarks:**

This surface plate shall sufficiently be used for making a machine basically.



2-6 Vise

Room No. & name of facilities	Da 101 Workshop Machinery-2 WI		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Uchida Yoko      Type HR-100	12	30	360

**Specifications:**

Horizontal vise (parallel vise)

Bench type

Opening width: 100 mm, open width: 100 mm or above

**Remarks:**

This vise shall be installed on a workbench and is convenient for processing.



2-7 Hacksawing machine

Room No. & name of facilities	Da 105 Workshop Piping WI		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Keihin Machine Type 200	590	1	590

**Specifications:**

Cutting capacity: max. 200 $\phi$ , 200 x 100 m/m square

Standard band saw blade: width 25 x thickness 0.9 x length 2,500 m/m

Speed of blade: 20, 30, 40 (m/min.) at 50 Hz

Bed height: 880 m/m

Bed width: 1,430 m/m

Floor space requirement: 1,150 x 480 m/m

Diameter of saw wheel: 270 m/m

Height from floor to vice table: 510 m/m

Weight: 250 kg

Motor used: AC 380V, 0.75kW (1 HP)

Motor for oil hydraulic lifting: AC 200V, 100W

Power source: AC 380V, 60Hz, 3 phases

Standard Accessories: 2 sets

Optional accessories:

1. Consumables ..... 1 set

2. Cutting oil can ..... 1 can

**Remarks:**

For cutting and working steel

Easy maintenance

2-8 Tool set

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Shimazdu Scientific Instrument      Metalworking tool set type A	110	90	9,900

Specifications:

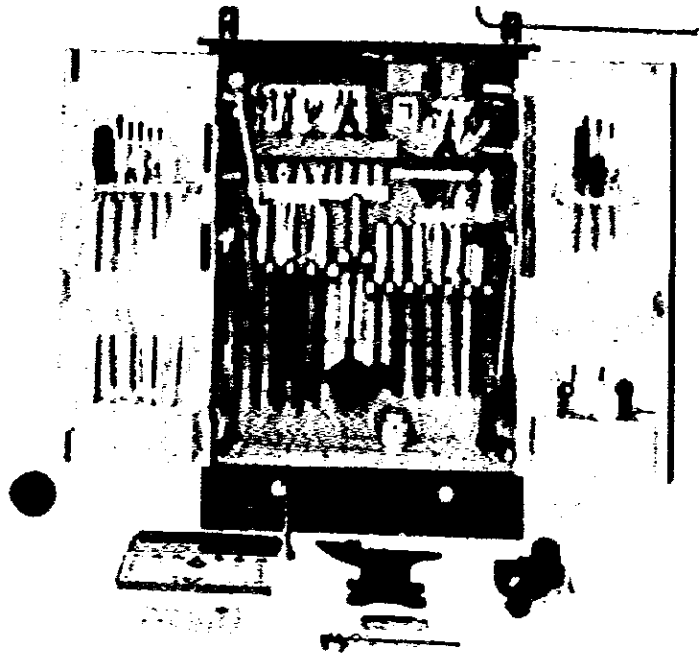
59 tools of 35 different kinds:

- |                                  |                           |
|----------------------------------|---------------------------|
| Anvil                            | Hand drill, with 6 drills |
| Hammer, large                    | Spring calipers, inside   |
| Hammer, small                    | Spring calipers, outside  |
| Mallet                           | Compasses                 |
| Pliers, large                    | Square                    |
| Pliers, small                    | Oil can                   |
| Pincette                         | Oil-stone                 |
| Pincers                          | Lead boiling pan          |
| Tinsmith's shears, straight type | Hand file, large          |
| Hacksaw                          | Hand file, medium         |
| Tinsmith's knife                 | Hand file, small          |
| Tinsmith's shears, curved type   | Square file, large        |
| Cold chisel, large               | Square file, small        |
| Cold chisel, small               | Triangular file, large    |
| Punch                            | Triangular file, small    |
| Scraper                          | Round file, large         |
| Soldering iron                   | Round file, small         |
| Solder                           | Semi-round file, large    |
| Screwdriver, large               | Semi-round file, small    |
| Screwdriver, medium              | Set of 5 files            |
| Screwdriver, small               | Nippers                   |
| Electrician's screwdriver, large | Paste                     |
| Electrician's screwdriver, small | Electrician's pliers      |
| Monkey wrench, large             | Jackknife                 |
| Monkey wrench, medium            | Vernier calipers          |
| Bench vice                       | Steel measure, 30cm       |
| Hand vice                        | Pliers                    |
| Wire vice                        |                           |
| Screw die                        |                           |

And a surface gauge and a set of small box wrenches  
 Wall cabinet ..... 1 pc.

Remarks:

Metalworking tool set for student



2-9 Cutter

Room No. & name of facilities	Da 101 Workshop Machinery-2 WI		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Noguchi Press Foot shear type FS-102	270	2	540

**Specifications:**

Foot stepping type cutter for steel plate

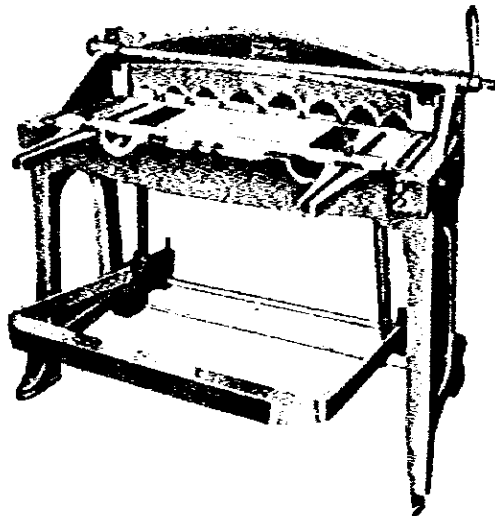
Plate work table:

Thickness: 1.6 m/m

Length: 1,250 m/m

**Remarks:**

For cutting and working steel plate and aluminum plate, from a standard steel plate into small pieces.



2-10-1 Hand shear

Room No. & name of facilities	Da 101 Workshop Machiner -2 Da 107 Workshop Sheet Metal	WI	WI
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Hirai Machinery                      Type HK-101	100	10	1,000

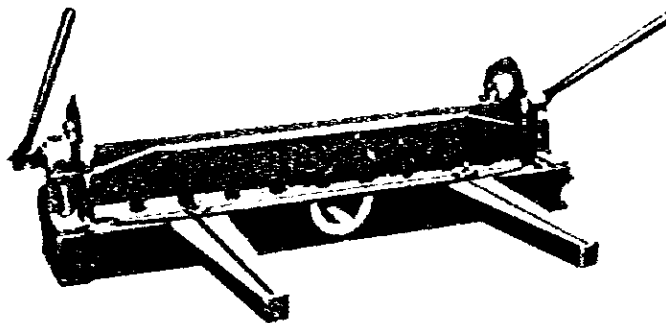
**Specifications:**

**Capacity:**            1.0 (thickness) x 1,000 m/m (length)

**Weight:**    about 80kg

**Standard accessories**

**Power source:** AC 220V    60Hz





2-10-2 Hand shear

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Hitachi Koki            type C-16	35	5	175

**Specifications:**

Capacity Steel      1.6 mm (1/16")

                  Stainless 1.2 mm (3/64")

Power input:            240W

No-load speed:        Stroke 1,900/min.

Overall length:        318 mm (12-1/2")

Weight:                 2.8 kg (6.2 lbs.)

Power source:         AC 220V, 60 Hz

**Standard accessories:**

1 Pair spare cutter, 1 Angle gauge,

1 Thickness gauge.

**Remarks:**

Maximum cutting and window-opening thickness of steel and aluminium plates: more than 1 mm

2-11 Crank press

Room No. & name of facilities	Da 107 Workshop Sheet Metal WI		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Noguchi press Type SP-205 5-ton new type No. 5 simple rotation	290	6	1,740

**Specifications:**

- Stroke: 50 m/m
- Room below ram: 190 m/m
- Diameter of crank shaft: 38 m/m
- Table area: 370 x 205 m/m
- Diameter of shank hole: 25.5 m/m
- Number of strokes per minute: 150
- Power required: 400 W (1/2 HP)

**Accessories:**

**Dies for bending:**

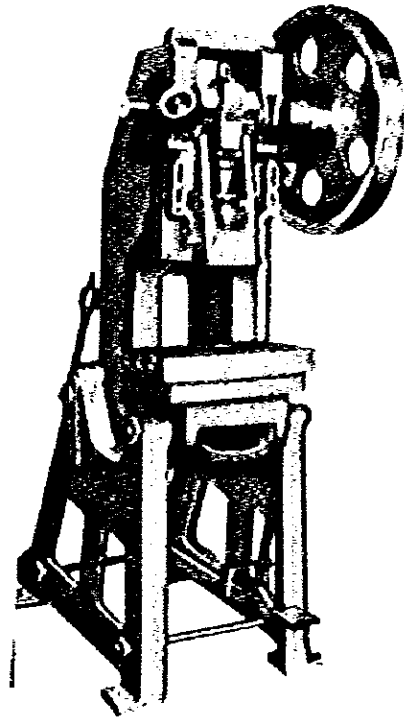
1. V-shape die larger than 50cm ..... 4 sets
2. L-shape die ..... 4

**Detail:**

1. Crank press for bending at right angle ..3 sets
2. Crank press for bending at right angle  
and with corner fillet.....3

**Remarks:**

To be installed one each in each classroom.  
For press-forming a large steel plate (exclusively for bending a long plate)  
Consideration on the safety of students should be given..



**2-12 Small-sized press**

Room No. & name of facilities	Da 107 Workshop Sheet Metal WI		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Noguchi press Single-sided hand press type 100	580	6	3,480

**Specifications:**

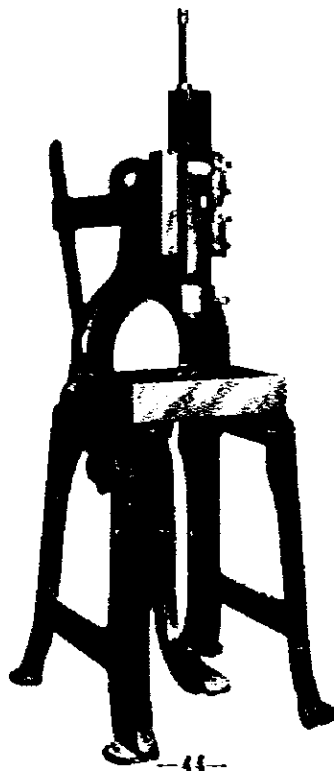
- Diameter of screw: 63 m/m
- Room below ram: 255 m/m
- Table area: 355 x 330 m/m
- Diameter of shank hole: 25.5 m/m
- Handle diameter: 740 m/m

**Accessories:**

Dies for punching round and square: 20, 30, 50, 70 mm $\phi$  to be stored in a storage box.

**Remarks:**

- Press for punching small holes
- Easy handling in plate working
- Sufficient consideration on the safety  $\phi$  in handling



2-13 Bender

Room No. & name of facilities	Da 101 Workshop Machinery-2 Da 107 Workshop Sheet Metal		WI	WI
Name of manufacturer & type for reference	Unit price	Q'ty	Amount	
Toyo Koko Finger brake type HB-24-150	700	12	8,400	

**Specifications:**

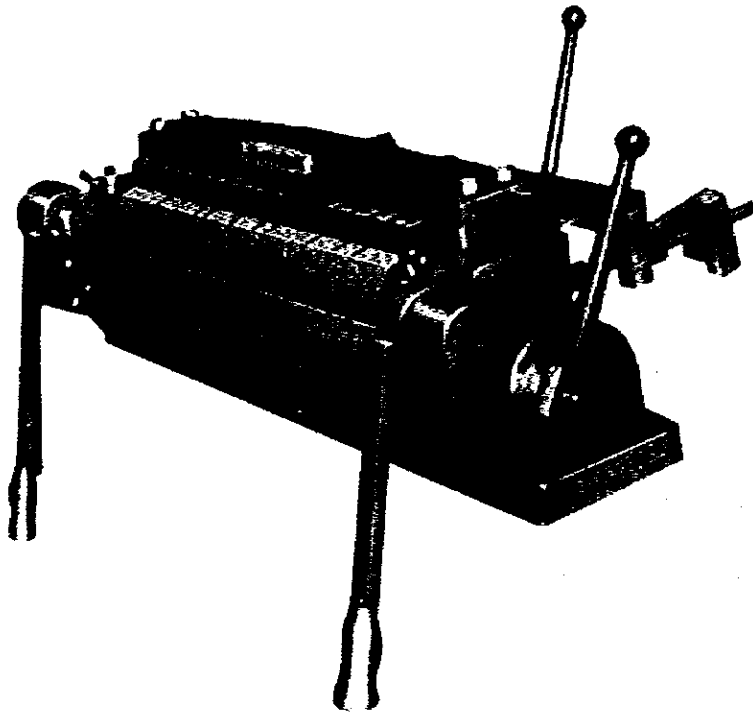
Bending width: 610 m/m at maximum  
 Plate thickness: 1.6 m/m (mild steel plate)  
 Processing of box: up to the height of 150 m/m  
 Machine size: 1,045 x 680 x 335 m/m

**Standard accessories:**

1. Combined fingers: L= 20, 25, 30, 35, 40, 80, 100, 200 (mm)
2. Extation fingers: L= 45 mm, right and left ..... one each

**Remarks:**

Universal hand-operated bending machine  
 Can make chassis for communication instruments, boxes, etc.



2-14 Electric drill

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Uchida Yoko      Type HA-3D with stand	40	30	1,200

**Specifications:**

Capacity: Wood      15 mm  
                  Steel      10 mm

With stand

Power source: AC 220V, 60 Hz

**Accessories:**

1. Drill chuck
2. Chuck wrench
3. Drill edge: 2.0 - 8 mm  
3 set of 12 edges

**Remarks:**

Small electric drill machine  
Handy-type  
Drill edge shall be attached with a stand.

2-15 Electric tool

Room No. & name of facilities			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Uchida Yoko Electric woodworking tool set type HS-35	70	12	840

Specifications:

Drill, Planer, Circular saw ..... 1 set

Self-contained motor and Circular saw stand

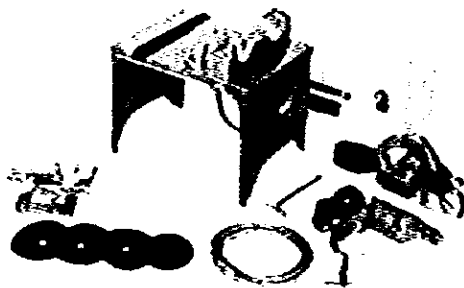
Power source: AC 220V, 60Hz

Accessories:

- 1. Flexible chuck
- 2. Drill edge ..... 2 sets
- 3. Polisher and sanding disc ..... 3 sets

Remarks:

Electric woodworking tool set in a cabinet





**2-16 Spot welder**

Room No. & name of facilities	Da 101 Workshop Machinery-2 WI		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Daido Kogyo Dalex portable spot welding gun type 3111	365	6	2,190

**Specifications:**

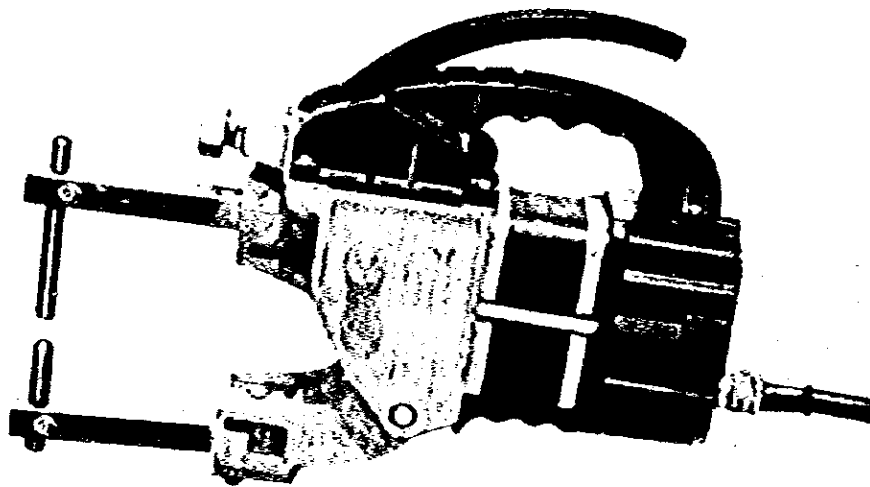
Rated capacity (utility ratio: 50%): 2.4 KVA  
 Maximum input (utility ratio: 1.5%): 17.5 KVA  
 Rated primary voltage: 220V (single phase)  
 Rated frequency: 60 Hz  
 Maximum secondary short-circuit current: 7,500 A  
 Distance between the electrode arms: 120 mm  
 Diameter of the electrode arm: 20 x 20 mm  
 Diameter of the electrode tip: 12 mm  
 Tip stroke (short/long): 23/57 mm  
 Power of increasing pressure (min/max): 60/180 kg  
 Welding capacity (steel plate): 2 + 2 mm  
  
 Power source: AC 220V, 60 Hz

**Accessories:**

1. Square arms for replacement: type 242/52N, 245/55N, 2005N, 2008/1092,
2. Electrode tip: type 1074N, 1082N, 1073N, 1087N, 1092N, 1088N, 1098N

**Remarks:**

Hand-operated spot welder  
 Can easily process the junction point of chassis and others.  
 Can process the steel plate and aluminium (thickness: 1 mm)



**2-17 Electric welder**

Room No. & name of facilities	Da 101 Workshop Machinery-2 WI		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	200	2	400

**Specifications:**

**Welding voltage: about 30V and variable**

**Power source: AC 220V, 60Hz**

**Accessories:**

1. Protector: helmet, hand shield, leather gloves, apron, arm and foot covers ..... 20 sets
2. Tools: tipping hammer, wire brush, sander ..... 10
3. Welding electrode holder: cable, holder, etc. .... 10

**Remarks:**

**Portable type AC small welding machine for assembling angles**

**2-19 Painting tools**

Room No. & name of facilities	Da 107 Workshop Sheet Metal WI		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	200	2	400

**Specifications:**

**Electric drying oven: 220V, about 10 kW**

**About 20 small transformer of less than 1 kW can be dried.**

**Remarks:**

**For drying small transformer (about 1 kW)**

**2-19 Painting tools**

Room No. & name of facilities	Da 107 Workshop Sheet Metal WI		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	500	1	500

**Specifications:**

Painting tools for consumer's use

1. Spray gun with an agitator
2. Hose
3. Compressor  
Working pressure: more than 10 kg/cm<sup>2</sup>

**Accessories:**

1. Lacquer for painting: colored large can 5 ..... 10 for each
2. Solvent: 10 cans
3. Infrared ray drier: 1 set

**Remarks:**

A set of painting tools for metal-painting of amplifiers and transmitters including infrared lamps for drying.

**2-20 Coiler**

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Taga Manufacturing      Coil Winder Model 19-B	250	10	2,500

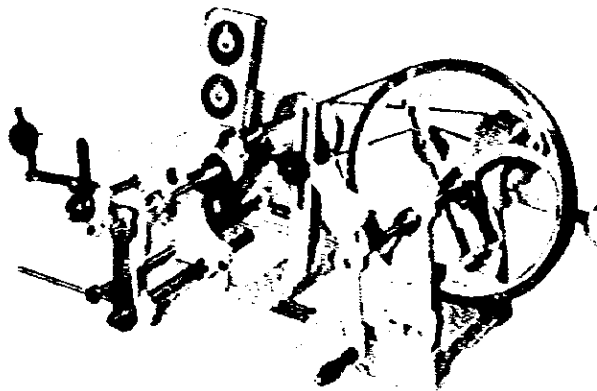
**Specifications:**

Manual belt hanger

Manual coil winder for

- |   |   |                                |
|---|---|--------------------------------|
| <ul style="list-style-type: none"> <li>1. Solenoid coil</li> <li>2. Transmission coil</li> <li>3. Honeycomb coil</li> </ul> | } | (a small type for a radio set) |
|---|---|--------------------------------|

With a rotation meter, bobbin (3 sets) and a bench for electric wire.



2-21 Engraving machine

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

**Specifications:**

**Engraving machines for metal and plastic plates**

**Can engrave a plate by tracing a drawing.**

**Remarks:**

**Small engraving machines for metal, plastic and ebonite plates .**

**2-22 Vacuum impregnator**

Room No. & name of facilities		-		
Name of manufacturer & type for reference		Unit price	Q'ty	Amount
Shimazdu Scientific Instrument	Rotary vacuum pump type S50-2	120	1	120
-	Vacuum tank	60	1	60
		(total)		180

**Specifications:**

Vacuum pump ..... 1 set

Vacuum tank . . . . . 1

More than 5 transformers can be accommodated.  
With a mechanism which can pour insulating oil

Power source: AC 220V, 60 Hz

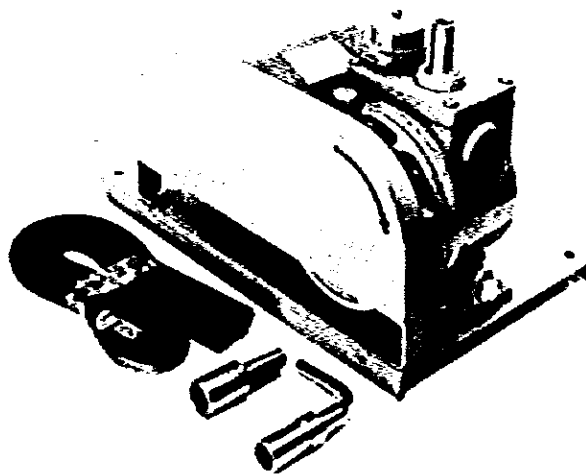
**Accessories:**

Insulating oil: 1 can

**Remarks:**

For impregnating the insulating oil into a small transformer (less than about 200 W)

Vacuum pump





**2-23 Nondestructive flaw detector**

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	800	2	1,600

**Specifications:**

**Supersonic non-destructive flaw detectors**

**Simple and handy type**

**Suitable for testing the welding part**

**Cannot easily be damaged even if it is set at the high-temperated place.**

**Remarks:**

**Small type**

**For testing the welding part**

**2-24 Pipe cutter**

<b>Room No. &amp; name of facilities</b>	Da 105 Workshop Piping WI		
<b>Name of manufacturer &amp; type for reference</b>	<b>Unit price</b>	<b>Q'ty</b>	<b>Amount</b>
-	150	2	300

**Specifications:**

- Pipe machine for bending and cutting ..... 1 set  
With stand
- Dice and tap for gas pipe ..... 1 set  
The diameter of gas pipes: standard size

**Remarks:**

Pipe processing machine for cutting, threading, bending and connecting a pipe (diameter: about 5cm)

**2-25-1 Tools for machinist and electrician**

<b>Room No. &amp; name of facilities</b>	-		
<b>Name of manufacturer &amp; type for reference</b>	<b>Unit price</b>	<b>Q'ty</b>	<b>Amount</b>
-	110	60	6,600

**Specifications:**

Same as No. 2-8

**2-25-2 Tools for machinist and electrician**

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	50	60	3,000

**Specifications:**

The following tools shall be contained in a tool box.

1. Insulated cutting plier
2. Nipper
3. Radio plier
4. Screw drivers for electricians: large, middle and small ... 1 set
5. Cable joint plier
6. Wire stripper
7. Electrician's band and tool bag
8. Gloves for electricians
9. Knife for electricians
10. Taper reamers: large and small ..... 1 set
11. Triangular drill
12. Pipe bender, cutter, screw cutter ..... 1 set
13. Plate work tools:
  - Folding table, leveling piece wood, knife blade,
  - Single cut chisel, leveling sheet metal

**2-26 Tools for plumber**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	60	60	3,600

**Specifications:**

- Pipe vice
- Die stock
- Pipe bender
- Ratchet braces
- Reamer
- Metal hammer and wood hammer
- Dice and tap for pipe: one each for standard use

**Accessories:**

- 1. Small articles for connecting a pipe ..... 1 set
- 2. Nipple and sealing parts: standard size ..... 1 set

**Remarks:**

A set of pipe processing tools  
 Pipe diameter is less than 30 mm

**2-28 Gauges for machinist**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	50	15	750

**Specifications:**

- 1. Carpenter's scale: 30 cm
- 2. Folding scale: for 1 m
- 3. Vernier calipers:
- 4. Micrometer gauge
- 5. Cellipers: 1 set

With metallic tool box

**Remarks:**

Tools for mechanical workmanship

2-29 Gauge

Room No. & name of facilities	--		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
--	100	6	600

Specifications:

Dial gauge, depth gauge, clearance gauge, R gauge, Angle gauge, pitch gauge, wire gauge, taper gauge, block gauge ..... 1 for each

Remarks:

A set of standard gauges for mechanical workmanship such as taper gauge, block gauge, etc.

**2-30 Stereomicroscope**

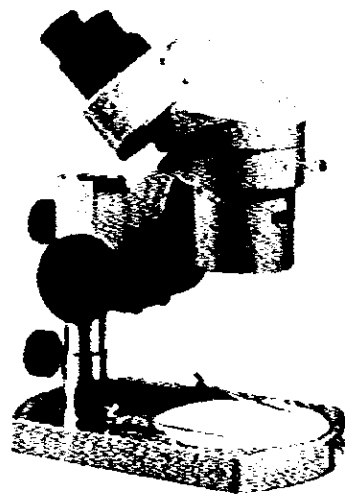
Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Olympus Stereo microscope type VB-R	85	2	170

**Specifications:**

- Body tube: 45° inclined 360° rotatable
- Focusing adjustment: controllable on both sides through vertical motion of body tube with fine adjustment system
- Magnification: 10 x - 60 x
- Eyepieces: G10x, G20x
- Objectives: 2x fixed
- Auxiliary objectives: 0.5x, 1.5x
- Adapter for television camera ..... 1

**Remarks:**

Metallurgical microscope for inspection of metallic surface



**2-31 Disk-top projector**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Uchida Yoko      Polarizing projector type CK-130	130	2	260

**Specifications:**

**Light source:** 21V, 150W halogen lamp with a cold mirror  
**Lense:** objective lense: 10x with a centering mechanism and a motor fan changeable

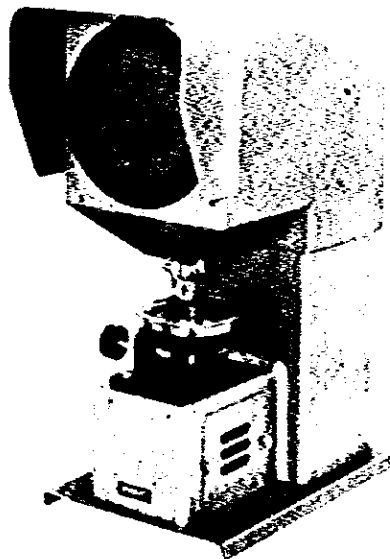
**Focus adjustment:** highly sensitive fine adjustment  
**Screen:** more than 130 mm $\phi$

**Magnification:** more than 25x  
**Stage:** 110mm $\phi$  with a circumferential scale and a vernier.

**With polarizer**

**Remarks:**

**Portable magnifying polirizing projector for projecting onto a glass screen.**





2-32 Worktable

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
- Worktable	-	73	3,030
Chairs	5	150	750
	(Total)		3,780

Specifications:

**Worktables:** made of steel, for metal working, wooden or pinoleum top with rubber board finish

**Dimension:**

1. 1,500 x 500m/m	.....	4 sets	x 30,000 =	120,000 yen
2. 1,500 x 750	.....	20	x 40,000 =	800,000
3. 1,500 x 1,000	.....	3	x 50,000 =	150,000
4. 1,800 x 500	.....	8	x 36,000 =	288,000
5. 1,800 x 760	.....	38	x 44,000 =	1,672,000
	(Total)	82		3,030,000 yen

**Difference:** within  $\pm 5\%$  in dimension is allowable

**Height:** 760 m/m

**Round chairs:** 30 x 5 sets ..... ..150 sets

**Remarks:**

Worktables of sturdy structure to withstand a heavy load.  
 Detachable or collapsible legs for easy transportation  
 Life: more than 10 years

2-33 Shelf

Room No. & name of facilities				
Name of manufacturer & type for reference	Unit price	Q'ty	Amount	
Uchida Yoko      Type SK-S      Shelf	60	20	1,200	
	55	32	1,760	
	(Total)		2,960	

**Specifications:**

Dimension: 1,760 W x 400 D x 880 H m/m ..... 20 sets

Separable into upper and lower halves.

Two shelf boards, glass doors for the upper half

Racks: about 1,820 W x 460 D x 2,102 H m/m ..... 32 sets

With 6 shelf boards, load: 300 kg, shelving board

**Remarks:**

For arranging the measuring instruments and parts.

2-34 Movable blackboard

Room No. & name of facilities	Da 103, 106 Workshop Assembly Da 104 Workshop Machinery-1 Da 105 Workshop Piping		WI WI WI
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	50	4	200

**Specifications:**

Movable blackboard: about 180 x 90 m/m

With casters

With fixed device

Steel painting

Both sided type

**Accessories:**

- 1. Eraser ..... 1 pc.
- 2. Electric eraser cleaner . . . . . 1
- 3. Chalk: red, yellow, green, blue .... 5 boxes  
white . . . . . 10

**Remarks:**

Metallic movable blackboard with casters  
Both sided type

**2-35-1 Copier**

Room No. & name of facilities	Da 102 Instructor's Office WI		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	400	1	400

**Specifications:**

Same as No. 1-4

**2-35-2 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

**2-35-3 Automatic slide projector**

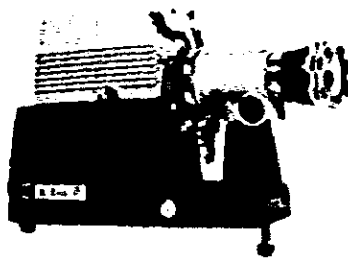
Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Shimazdu Scientific Instrument	80	1	80
Master slide projector			
Daylight screen	40	1	40
	(Total)		120

**Specifications:**

- 35 m/m slide projector
- The frames shall be sent one by one.
- Remote controlled sending adjuster
- Slide mount case: 10
- Daylight screen: 1.80 x 1.80 (H x W) m

**Remarks:**

Light source shall have a sufficient power and is easy to handle.  
 The cooling fan is automatic still when is switched off.



**2-35-4 Movie projector**

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

**Specifications:**

Same as No. 1-12

**2-35-5 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

2-35-6 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

2-36-1 Materials for practice

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

**Specifications:**

Bar: Iron: 5, 10, 15, 20, 25 m/m x 1m ..... 30 for each  
 Aluminium: 3, 5, 10, 25 m/m x 1m ..... 30 for each  
 Brass: 3, 5, 10 m/m x 1m ..... 30 for each

**Wiring materials:**

Vinyl insulating electric wire (1 turn: 100m): 0.4, 0.6, 0.8, 1.0 m/m $\phi$   
 (standed wire) ..... 5-colored sets  
 5 for each

Enamelled electric wire: 0.2, 0.3, 0.4, 0.5, 0.6, 0.8,  
 1.0, 1.2 m/m  $\phi$ ..... each 5kg x 10

Electric wire: 0.8, 1.0, 1.2 m/m  $\phi$  ..... each 5kg x 10

Plates: Iron: 0.5, 1, 2, 3 m/m (thickness) 1 x 2 m .. 50 for each  
 Aluminium: 0.5, 1, 2 m/m ( " ) 1 x 2 m .. 50 for each  
 Copper: 0.5 m/m (thickness) 1 x 2 m .. 50

Angle: Iron: 15 x 15 m/m, 25 x 25 m/m, Length: 3 m... 50

**Remarks:**

Be used for the practical training of a basic workmanship by using the combination of the metallic material, wiring material, workmanship material.



**2-36-2 Materials for practice**

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

**Specifications:**

- 1.6 m/m vinyl insulating wire ..... 1 turn (100m)
- Metallic pipe: less than 3cm (standard type) ..... 5 for each
- Outlet and flashing switch .. . . . . 10 pcs.
- Knob insulator .. . . . . 10 pcs.
- Bushing .. . . . . 100 pcs.
- Lock nut .. . . . . 100 pcs.
- Binding wire .. . . . . 1 turn (100 m)
- Wood screw: 55 m/m .. . . . . 1 gross
- 20 m/m .. . . . . 1 gross
- Saddle .. . . . . 100 pcs.
- Insulating bush .. . . . . 100 pcs.
- 1.6 m/m parallel vinyl insulating wire . . . . . 1 turn (100m)
- Staple .. . . . . 100 pcs.
- Sleeve .. . . . . 100 pcs.
- Receptacle .. . . . . 100 pcs.
- Flush type tumbler switch .. . . . . 10 pcs.
- Surface tumbler switch .. . . . . 10 pcs.
- Compressed terminal: every kind .. . . . . 1 gross
- Three-point switch .. . . . . 10 pcs.
- Vinyl armored cable .. . . . . 1 turn (100m)
- Joint box .. . . . . 10 pcs.

**Remarks:**

A set of materials for indoor electric wiring

2-37 Materials for practice

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

Specifications:

- Vinyl tape: 10-colors ..... 100 for each
- Insulating cloth: used for a small transformer ..... 100m x 2 turns
- Insulating paper: - ditto - ..... 100m x 2 turns
- Paper tape ..... 100m x 2 turns
- Kraft paper ..... 100m x 2 turns
- Cotton tape ..... 100m x 2 turns
- Insulating varnish ..... 10 cans
- High frequency varnish: 500 cc ..... 30 cans
- Vinyl bar: 0.3, 0.5, 0.8, 1.0 m/m  $\phi$  ..... 50 for each
- Bake bar: 1.5 - ditto - ..... 50 for each
- Bake plate: 1.5 mm, 2 mm (thickness), 1 x 1 m ..... 50 for each
- Venner plate: 3-lap, 5-lap 1 x 2 m ..... 50 for each
- Vinyl plate: 1.0 m/m, 2.0 m/m (thickness) 1 x 2 m .. 50 for each
- Volts and nuts: 3, 4, 5  $\phi$  x 15 m/m ..... 1 gross for each

Remarks:

Non-metallic materials and Insulating materials  
 Materials necessary for a student to make parts for transformer,  
 radio and television set.

**2-38 Materials for transformer**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Kimura Electric Works	20	180	3,600

**Specifications:**

**500 VA single phase assembly kit:**

**Primary: 100V**

**Secondary: 100V + 100V**

**Winding machine**

**Insulating tape, kraft paper ..... each volume for three times**

**Electric wire; ..... each volume for three times**

**With a description of design and a operation guidance**

**Remarks:**

**For studying practical technology to make a transformer (from winding to assembling)**

**2-39 Preparatory tools for practice**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Qty	Amount
-	50	5	250

**Specifications:**

**Hammer:**

- Iron hammer: large, middle and small type ..... 1 for each
- Wood hammer: - ditto - ..... 1 for each
- Plastic hammer: - ditto - ..... 1 for each

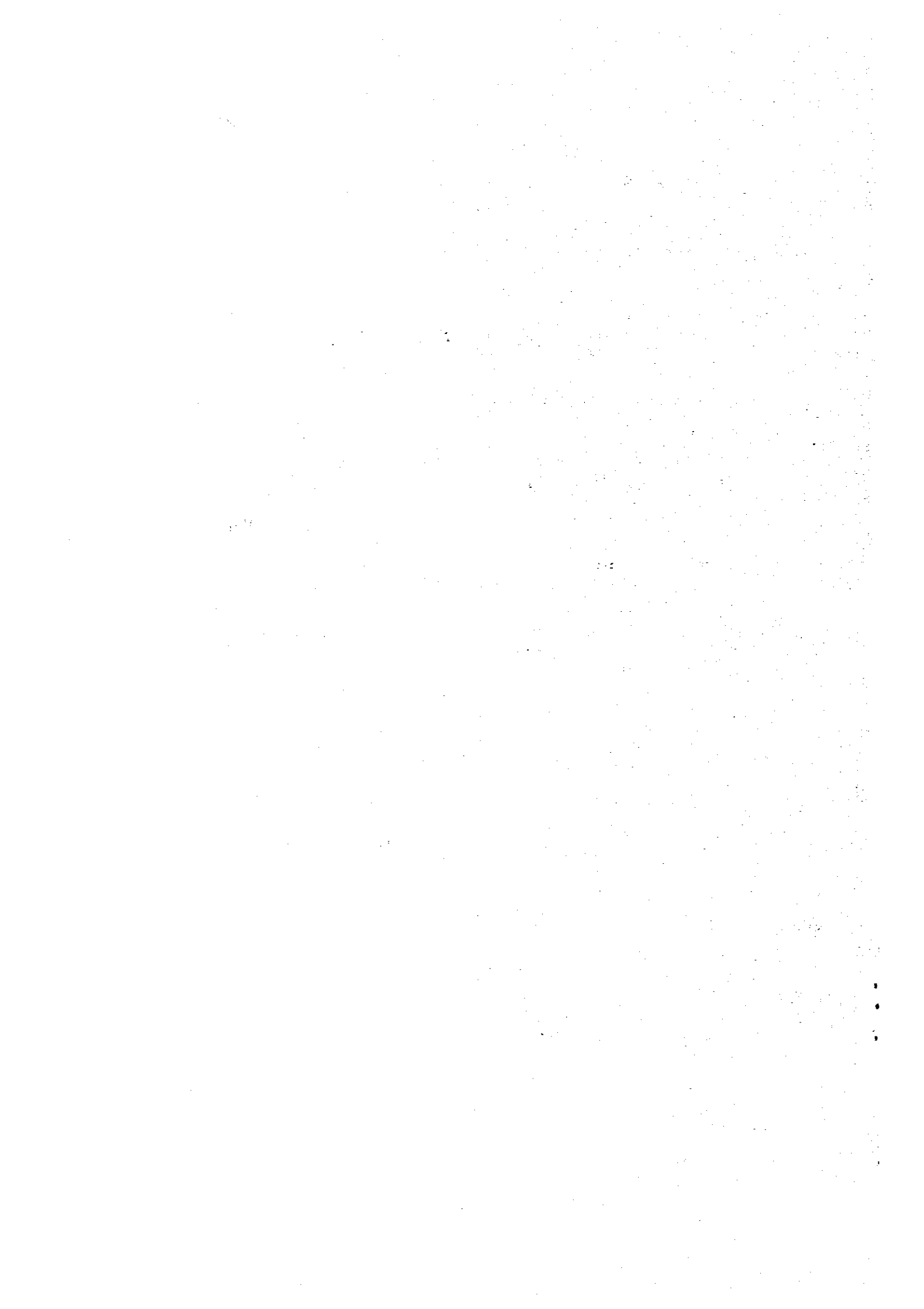
- Plier, pinchers, knife for electric work ..... 1 for each
- Adjustable angle wrench ..... 1 pc.
- Pipe wrench ..... 1 pc.
- Screw driver for wiring: middle and small type ..... 1 for each
- Screw driver for electric work: large, middle and small type ..... 1 for each
- Phillips type screw driver for wiring: middle and small type ..... 1 for each
- Phillips type screw driver for electric work: large, middle and small type ... 1 for each
- Box wrench: every kind ..... 1 set
- Nut driver: every kind ..... 1 set
- Iron saw ..... 1 pc.
- Scriber ..... 1 pc.
- Punch ..... 1 pc.
- Hand drill ..... 1 set
- Bench vice: 50 m/m ..... 1 pc.
- File: large, middle and small type ..... a set of 5 pcs.

### **3. Workmanship II**

**Cost of equipment :**

**Price Thousand Yen : 118, 133**

**Price US \$ : 605, 810**



3-1 Cutter

Room No. & name of facilities	Da 207 Workshop Sheet Metal-1 WII		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	270	2	540

**Specifications:**

Same as No. 2-9

**Remarks:**

For cutting steel plate of 1.0 mm or larger thickness and 1 m x 2 m standard size.

### 3-2-1 Small-sized shear

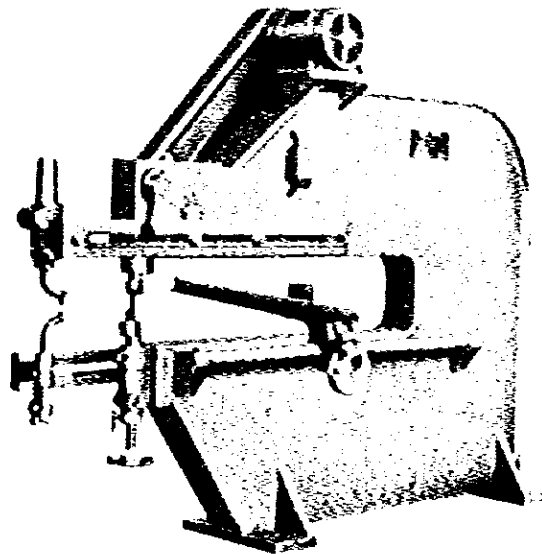
Room No. & name of facilities	Da 207 Workshop Sheet Metal-1    WII Da 202 Workshop Sheet Metal-2    WII		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Toyo Koki	500	2	1,000

#### Specifications:

- A forming machine utilizing a high speed vibration
- Capable of working metal plate, especially steel plate and aluminum plate, of at least 1 mm thickness.
- Circular cutting, diameter maximum 100 cm
- Maximum linear cutting distance: 50 cm
- Capable also of working plastic plate

#### Remarks:

A cutting machine capable of cutting, inside cutting, bending, slitting and dish forming by vibro-shearing and is suitable for chassis or cases for communication machines.





**3-2-2 Small-sized shear**

Room No. & name of facilities	Da 207 Workshop Sheet Metal-1 Da 202 Workshop Sheet Metal-2		WII WII
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	100	7	700

**Specifications:**

Same as No. 2-10-1

**3-3 Bench drill press**

Room No. & name of facilities	Da 207 Workshop Sheet Metal-1 Da 202 Workshop Sheet Metal-2		WII WII
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	180	9	1,620

**Specifications:**

Same as No. 2-2

**3-4 Electric drill**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	40	16	640

**Specifications:**

Same as No. 2-14

**3-5 Bender**

Room No. & name of facilities	Da 207 Workshop Sheet Metal-1 WII Da 202 Workshop Sheet Metal-2 WII		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	700	12	8,400

**Specifications:**

Same as No. 2-13

**3-6 Small-sized press**

Room No. & name of facilities	Da 207 Workshop Sheet Metal-1 Da 202 Workshop Sheet Metal-2	WII WII	
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Noguchi Press      Foot press 100 kan (375 kg)	580	7	4,060

**Specifications:**

Room below ram: 140 m/m  
 Table area: 305 x 150 m/m  
 Shank hole diameter: 25.5 m/m

**Accessories:**

Punching dies for steel plate of more than 1 mm thickness:  
 16, 20, 25, 30 mm (round, square)  
 stored in a box

**Remarks:**

cf. 2-12

**3-7-1 Crank press**

Room No. & name of facilities	Da 207 Workshop Sheet Metal-1 Da 202 Workshop Sheet Metal-2	WII WII	
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	290	2	580

**Specifications:**

Same as No. 2-11

**3-7-2 Crank press**

Room No. & name of facilities		-		
Name of manufacturer & type for reference		Unit price	Q'ty	Amount
Lead	Hydraulic power man type HP-1	100	4	400

**Specifications:**

**Oil-pressure hand punch:**

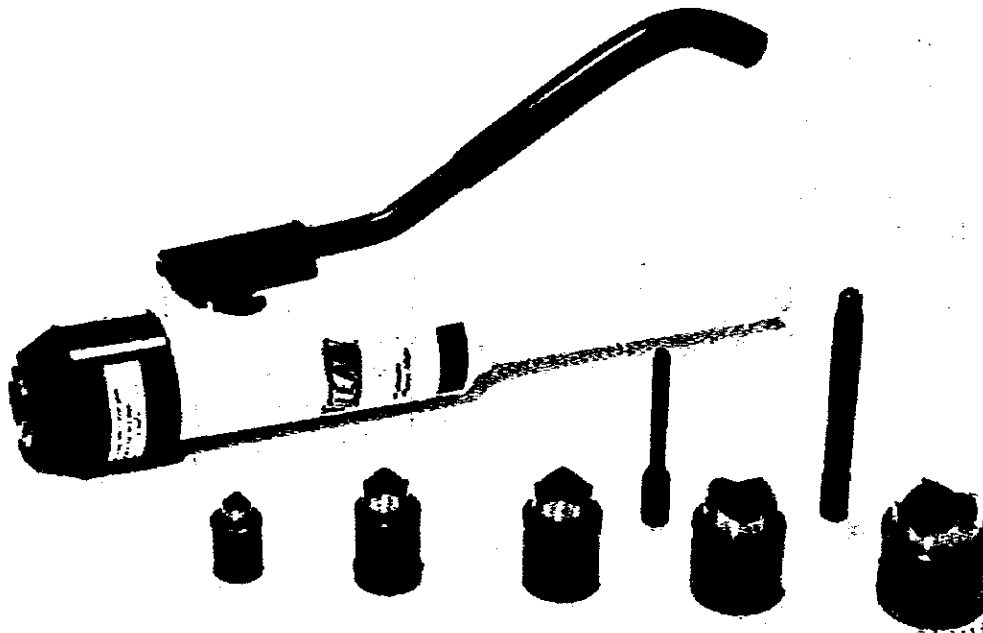
**Capacity:** more than 1.5 m/m thickness of steel, stainless steel and aluminium.

**Round edge:** diameter of 10, 16, 20, 25, 30 m/m with shafts

**Square edge:** 20 x 20, 30 x 30, 40 x 40, 50 x 50 m/m

**Remarks:**

Can open a round or square hole by using an attached punch.



**3-8 Electric grinder**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
	50	4	200

**Specifications:**

Same as No. 2-4-2

### 3-9 Electric tool

Room No. & name of facilities			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Hitachi Koko      Type DL-10RA	57	6	342
	10	6	60
	7	6	42
	(Total)		444

#### Specifications:

1. Electric drill  
Power input: 340W  
Capacity: steel 10.0 mm
2. Drill stand: vertical type
3. Circular saws  
Blade external diameter: 152 mm
4. Sander: with rubber mat and sanding disc.
5. Electric buffer  
External diameter: 125 mm  
Thickness: 40 mm
6. Jig saw  
Capacity:  
Wood: 30 mm  
Mild steel plate: 2mm
7. Grinder  
Wheel size:  
External diameter: 90 mm  
Hole diameter: 16 mm
8. Planers  
Cutting width: 82 mm  
Cutting depth: Max. 1 mm
9. Polisher
10. Impact drill  
Capacity:  
Concrete: 10 mm
11. Orbital sander: with sanding disc

**12. Contained Box**

**Power source: AC 220V, 60 Hz**

**Accessories:**

- Drills for wood and metal works ..... 12 a set**
- Drill chuck: max. grip diameter 10 mm**
- Jig saw blades ..... 3 a set**

**3-10 Spot welder**

Room No. & name of facilities	Da 207 Workshop Sheet Metal-1 Da 202 Workshop Sheet Metal-2		WII WII
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	365	7	2,555

**Specifications:**

**Same as No. 2-16**

**3-11 Painting machine**

Room No. & name of facilities	Da 202 Workshop Sheet Metal-2 W11		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	500	1	500

**Specifications:**

Same as No. 2-19



**3-12 Engraving machine**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
- Same type as No. 2-21	500	2	1,000
	300	2	600
	(Total)		1,600

**Specifications:**

1. Same as No. 2-21 ..... 2 sets  
Can engrave lines or letters on a metallic plate, plastic plate, etc. by tracing a drawing.
2. Engraving machines for steel plate or aluminium plate .... 2 sets  
Alphabets, symbols and figures can be engraved easily on a metallic plate.

Power source: AC 220V 60Hz

**Remarks:**

- Can engrave name plate stamp easily same as a typewriter.
- Can engrave circuit pictures on metal, epoxy resin bakelite plates.



**3-13 Coiler**

Room No. & name of facilities	-			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount	
Taga Manufacturing      Coil Winder Model 32A	100	10	1,000	

**Specifications:**

**Solenoid winding machine: wire diameter 1 mm at maximum**

**Honeycomb winding machine**

**Coil bench**

**Bobbin**

**Winding counter**

**Manual handle**

**Accessories:**

**Insulating paper: 100 m**

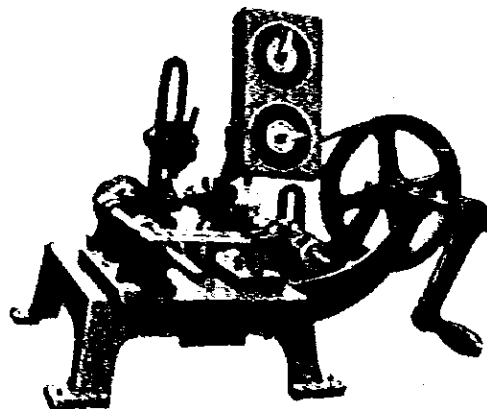
**Insulating silk: 100 m**

**Insulating tape: 100 rolls**

**Remarks:**

**High-frequency coil winding machine for small size transformer, radio and television set.**

**Handy type**



**3-14 Vise**

Room No. & name of facilities	Da 207 Workshop Sheet Metal-1 Da 202 Workshop Sheet Metal-2		WII WII
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	12	20	240

**Specifications:**

Same as No. 2-6

**3-15 Tools for plateworking**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	160	60	9,600

**Specifications:**

Same as No. 2-8 and 2-25-2.

3-16 Wiring tools

Room No. & name of facilities			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Shimazdu Scientific Instrument      Electrician's tool set	45	100	4,500

**Specifications:**

**Tools for radio wiring in a case**

- Nipper
- Radio pliers
- Wire stripper
- Soldering iron: 30W for IC
- Solder
- Paste
- Screwdriver: large, middle and small ..... one for each
- Phillips screwdriver: - ditto - ..... one for each
- Scale
- Spanner ..... five a set
- Adjustable angle wrench
- Box driver: large and small ..... one for each
- Nut driver: 3, 4, 5, 6 m/m
- Tweezer
- Alignmentscrew driver: 75 m/m
- Center punch
- File ..... five a set
- Chassis reamer

**Accessories:**

- Bolts and nuts: 3 x 10 m/m ..... 2 grosses
- Washer ..... 1,000 pcs.
- ..... 1,000 pcs.
- With parts case

**Remarks:**

- Electrician's tool set
- Radio and electronic instrument wiring
- Print panel wiring

**3-17 Induction motor for assembly practice**

Room No. & name of facilities		--		
Name of manufacturer & type for reference		Unit price	Q'ty	Amount
Seikosha	3-phase induction motor for assembly	400	12	4,800
	Electric dynamometer	550	12	6,600
		(Total)		11,400

**Specifications:**

**1. Winding type 3-phase induction motor**

- Capacity: 3.7 kW
- Number of pole: 4
- Rotation: 1,800 rpm
- Voltage: 220 V
- Frequency: 60 Hz
- Electric current: 13.2A
- Power source: AC 380V 60 Hz 3-phase

**2. Electric dynamometer (separate shunt type)**

- Eddy current brake type
- Capacity: 1 kW
- Number of pole: 4
- Rotation: 1,800 rpm
- Exciting voltage: DC 100V
- Exciting electric current: 3A
- Electric current: 10A

**Measurable items:**

- 1. Shaft input and shaft output
- 2. Start torque
- 3. Temperature rise
- 4. Revolution per minute

**Accessories:**

- 1. Starting rheostat ..... 1 set
- 2. Spring balance meter ..... 1 set
- 3. Tacho-meter ..... 1 set
- 4. Field rheostat ... ..... 1 set
- 5. Common bed and universal base with fundamental bolts ..... 1 set
- 6. Coupling ..... 1 set

**Remarks:**

For assembly practice  
The design and assembly guidance book shall be attached.

**3-18 DC motor for assembly practice**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Seikosha                      DC compound-motor	300	16	4,800

**Specifications:**

**DC compound-motor:**

- Capacity: 0.5 - 1.0 kW
- Electric current: 6 - 13A
- Voltage: DC 100V
- Number of pole: 4
- Rotation: 1,800 rpm

Can be used as a DC compound generator

**Accessories:**

- 1. Field rheostat ..... 1 set
- 2. Starting rheostat ..... 1 set
- 3. Bobbin ..... 1 set
- 4. Copper wire: 0.8  $\phi$  ..... 5 kg

**Remarks:**

For assembly practice  
The design and assembly guidance book shall be attached.

**3-19 Printing machine for printed circuit board**

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

**Specifications:**

**Jet etching device:**

Both surfaces of the plate shall be able to be etched at the same time.  
 Thirty plate of 200 x 200 m/m can be etched at the same time.  
 This device shall be attached with a heater.  
 A set of small articles

**Accessories:**

Plate for printing ..... 500 (for photo-etching)

**Remarks:**

Can make small print plates for an amplifier.

3-20 Tools for making printed circuit boards

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

**Specifications:**

Soldering iron: 15 - 30 W .....	5 pcs.
Tweezer .....	2
Nipper .....	3
Radio plier .....	3
Screw driver, Phillips type screw driver .....	3 for each
Wire stripper Type A (JIS) .....	1
Transfer pen .....	5
Mini-drill: needle 0.8 - 1.2 m/m .....	10
AC adaptor .....	1
Cutter .....	3
Nylon scrubbin brush .....	5
Loupe .....	5
Positive sensitive plate printer .....	1

**Remarks:**

A complete set of materials for photo-etching for students.  
20 sets



**3-21 Circuit tester**

Room No. & name of facilities	-			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount	
Yokogawa Electric Works      type 3201	20	17	340	

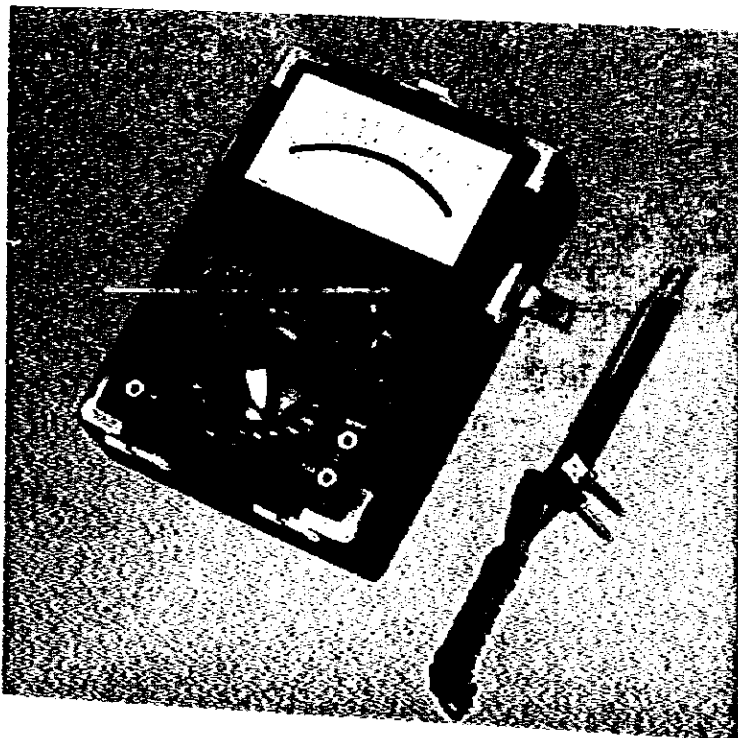
**Specifications:**

**Measuring range:**

- DCV: 0.3 / 1.2 / 3 / 12 / 30 / 120 / 1,200 V
- DCA: 0.012 / 0.12 / 1.2 / 12 / 120 / 1,200 mA
- ACV: 3 / 12 / 30 / 120 / 300 / 1,200 V
- Resistance: 2 / 200 / 20,000 kΩ
- Decibel: -20 - 43dB

**Accessories:**

1. Dry cell ..... 2 sets
2. Lead with Probe and Plug ..... 1 pair



**3-22 Electronic volt & ohm meter**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Kikusui Electronic Corporation      Type 107A	30	17	510

**Specifications:**

**Measuring range:**

1. DC voltmeter: 0 - 1.5 - 1,500V, 7 ranges  
Accuracy: within 3%  
Input resistance: 11M  $\Omega$
2. AC voltmeter: 0 - 1.5 - 1,500V rms, 7 ranges  
Accuracy: within 5%  
Frequency response: 15Hz - 4MHz
3. Ohmmeter: 0 - 0.1 - 1,000 M $\Omega$ , 7 ranges  
Accuracy : within 5%

**Power source:** for AC and DC

**Accessories:**

Test probes ..... 2 pcs.

3-23 Voltmeter

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Yokogawa Electric Works	20	60	1,200
DC voltmeter type 2011			
AC voltmeter type 2013	16	40	640
	(Total)		1,840

Specifications:

1. Moving coil type DC voltmeter

Class: JIS C 1102 0.5 class

Ranges:

0.3/1/3/10 (V) ..... 30 sets  
 3/10/30/100 (V) ..... 20 sets  
 30/100/300 (V) ..... 10 sets

2. Moving coil type AC voltmeter with rectifier

Class: JIS C 1102 0.5 class

Ranges:

15/30 (V) ..... 20 sets  
 75/100 (V) ..... 20 sets

Remarks:

Portable DC and AC voltmeters convenient for students' use.

3-24 Ammeter

Room No. & name of facilities				
Name of manufacturer & type for reference		Unit price	Q'ty	Amount
Yokogawa Electric Works	DC ammeter type 2011	18	60	1,080
	AC ammeter type 2013	14	40	560
	(Total)			1,640

Specifications:

1. Moving coil type DC ammeters

Class: JIS C 1102 0.5 class

Range:

3/10/30/100	( $\mu$ A) .....	15 sets
1/3/10/30	(mA) .....	20
10/30/100/300	(mA) .....	15
1/3/10/30	(A) .....	10

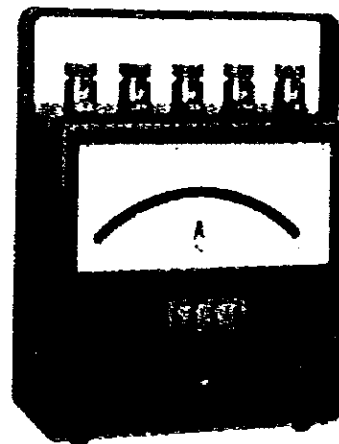
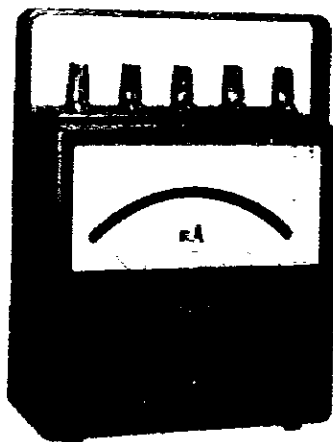
2. Moving iron type AC ammeters

Class: JIS C 1102 0.5 class

Range:

20/100	(mA) .....	15 sets
0.2/1	(A) .....	15
5/25	(A) .....	10

Total: 100 sets



3-25 LCR meter

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Ando Electric Universal Bridge type LCR-6	110	6	660

**Specifications:**

**External oscillator: 50 Hz to 10 kHz**

**Internal detector: 50 Hz to 10 kHz, can be tuned to 1 kHz.**

**Measurement range:**

**R: 50mΩ to 2MΩ**

**L: 5μH to 200 H**

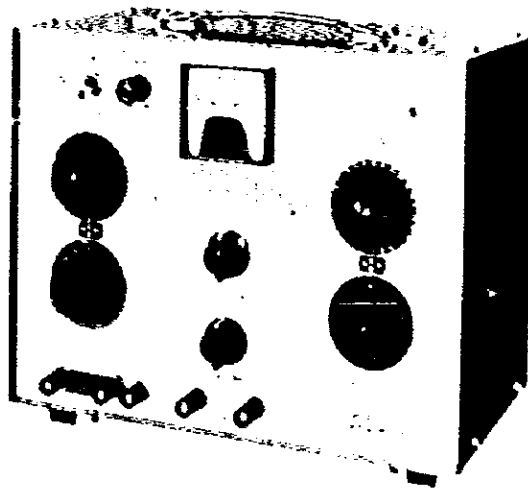
**C: 5pF to 200μF**

**Tan δ : 0.2 to 200%**

**Accuracy: within ± 0.5%**

**Remarks:**

**Can measure R, L, and C easily and accurately.**



3-26 Megger

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Yokogawa Electric Works Transistorized insulation tester type 3213	20	4	80

**Specifications:**

All-transistor insulation resistance tester

Rated voltage: 500 V

Range: 0 -  $\infty\Omega$

lowest scale line: 0.05 M $\Omega$

highest scale line: 100 M $\Omega$

Center scale mark: 2M $\Omega$

**Accuracy:**

Insulation resistance measurement:

Within  $\pm 5\%$  of indicated value for effective measuring range 1

Within  $\pm 10\%$  of indicated value for effective measuring range 2

Within 0.7% of scale length at infinity and zero

Tolerance of voltage across measuring terminals:

more than 90% of the rated voltage for the center scale mark.

**Accessories:**

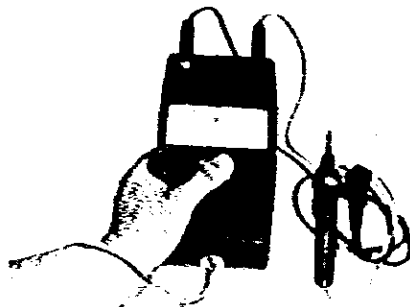
1.5 V dry cells ..... 8 pcs. (self-contained)  
(JIS C 850L, type UM-3)

1 m lead with a probe ..... 1 pc.

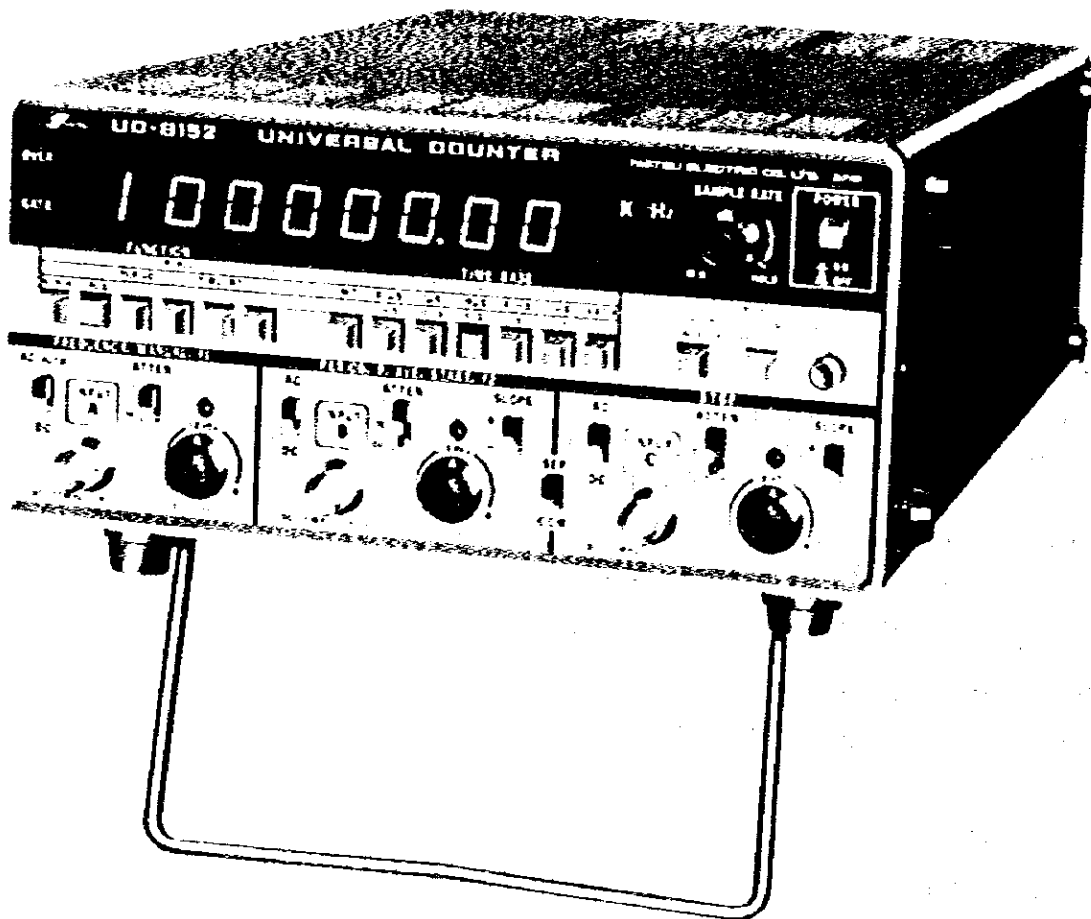
Case ..... 1

**Remarks:**

Handy typed automatic meggar tester









**3-28 Galvanometer**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Shimazdu Scientific Instrument      Type HQ-30	8	8	64

**Specifications:**

**Sensitivity:**  $2 \times 10^{-4}$  V and  $3.5 \times 10^{-6}$  A

**Class:** more than JIS 2.5 class

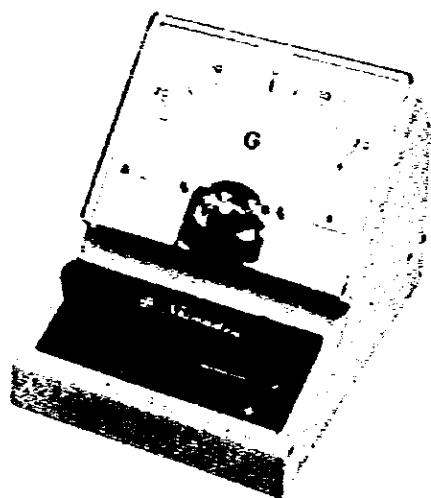
**With inclined dial**

**With short bar**

**Plastic case ..... 1**

**Remarks:**

**A inclined type galvanometer for students' practice.**



3-29 Rheostat

Room No. & name of facilities			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Yokogawa Electric Works      Slide Resistors type 2791	30	40	1,200

**Specifications:**

**Variable Slide Resistor**

**Allowable deviation:  $\pm 20\%$  of nominal value**

**Insulation resistance: more than  $5M\Omega$  at 500 V DC between terminal and case**

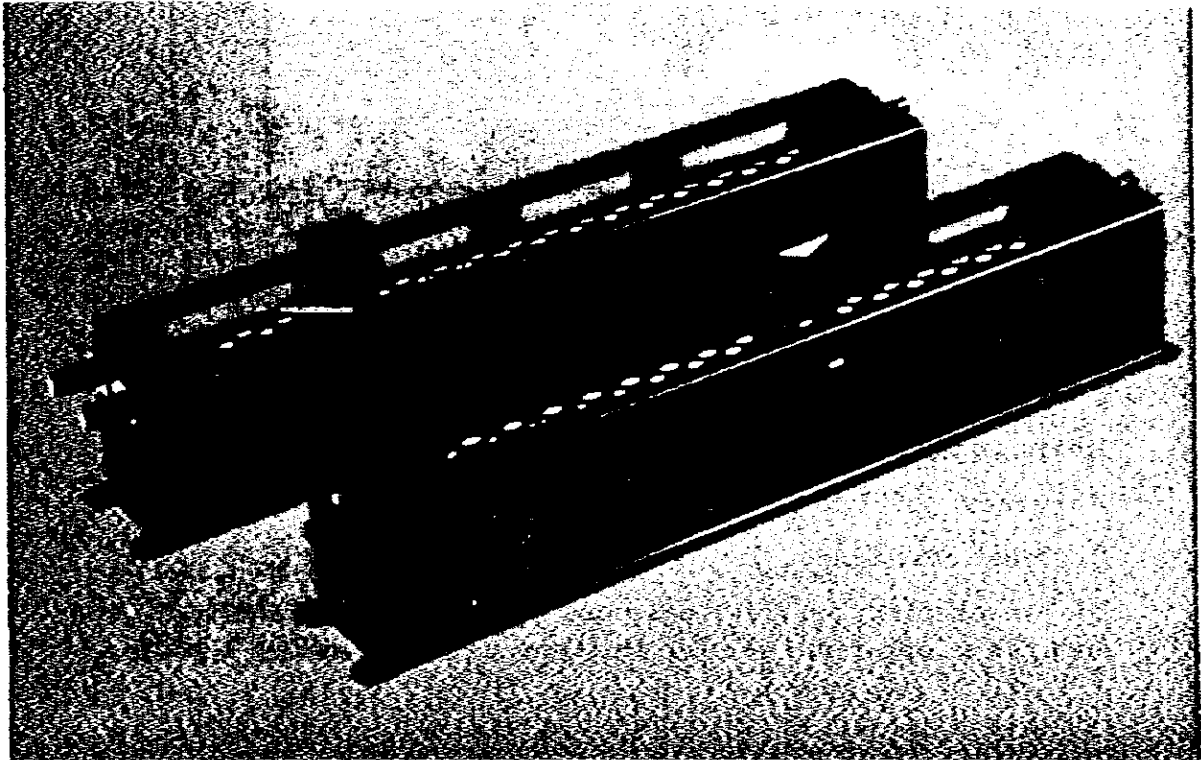
**Dielectric voltage: 1,000 V AC for one minute between terminal and case**

**Equally to every room:**

- 1.  $4,800\Omega$       10 pcs.
- 2.  $1,400\Omega$       10
- 3.  $600\Omega$       10
- 4.  $170\Omega$       5
- 5.  $39\Omega$       0
- 6.  $10\Omega$       5
- 7.  $4.7\Omega$       0

**Remarks:**

The sliding part and brush are designed to withstand the current that flows through them.



### 3-30 Resistor

Room No. & name of facilities	-			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount	
Yokogawa Electric Works Decade resistance box type 2786	70	40	2,800	

#### Specifications:

Variable decade resistance box with 6 dials

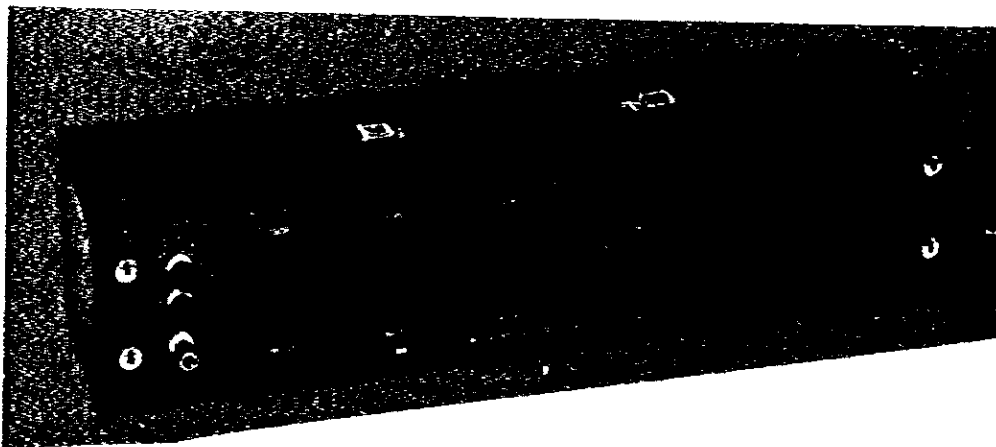
Dial arrangement:  $0.1\Omega \times 10 + 1\Omega \times 10 + 10\Omega \times 10 + 100\Omega \times 10 + 1,000\Omega \times 10 + 10,000\Omega \times 10$

Resistance range: 0.1 to 111,111 $\Omega$

Accuracy:  $\pm 0.1$  to  $\pm 3\%$

Residual resistance: less than 25m $\Omega$

Dial mechanism provides easy and quick resistance settings, and endures a long-term use for students' experiment.



3-21 AC bridge

Room No. & name of facilities	-			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount	
Megro Denpa Sokki      Universal bridge type MZ-827	130	3	390	

Specifications:

Measurement range:

C: 1 pF - 110 $\mu$ F  
 L: 1 $\mu$ H - 110 H  
 R: 0.1 $\Omega$  - 11 M $\Omega$   
 D (1,000 Hz): 0 - 10

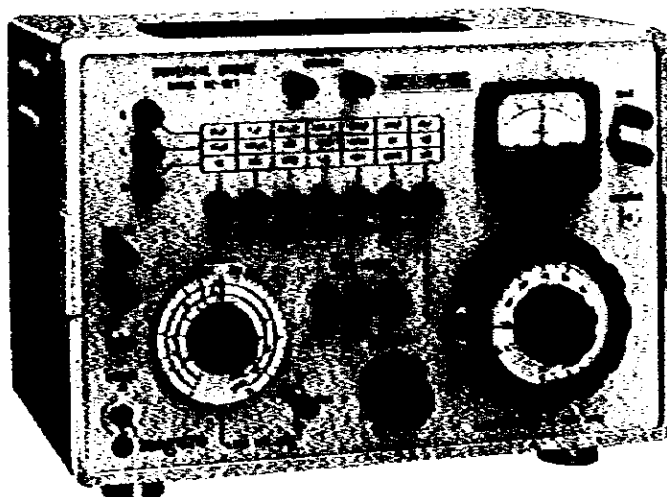
Source:

Int. : 1kHz  
 DC, 0 - 5, 0 - 350 V  
 Ext.: 20 Hz - 20 KHz

Self-contained detector

Remarks:

AC bridge for L, C, and R measurements  
 L measurement can be made in the state of DC flowing.



3-32 Transistor tester

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Leader Type LTC-905	400	2	800

**Specifications:**

**Collector/drain sweep**

**Frequency: 100 Hz**

**Sweep wave form: saw buave form or both waves rectifying form**

**Voltage: 0 - 10 and 100 V at max.**

**8 steps of above**

**Current: 100 mA or above**

**Step generator**

**Current/step: 10  $\mu$ A - 1.2 mA**

**7 steps or above**

**Voltage/step: 0.1 - 0.5 A**

**3 steps or above**

**EXT bias: can draw a curve by using a external bias power source**

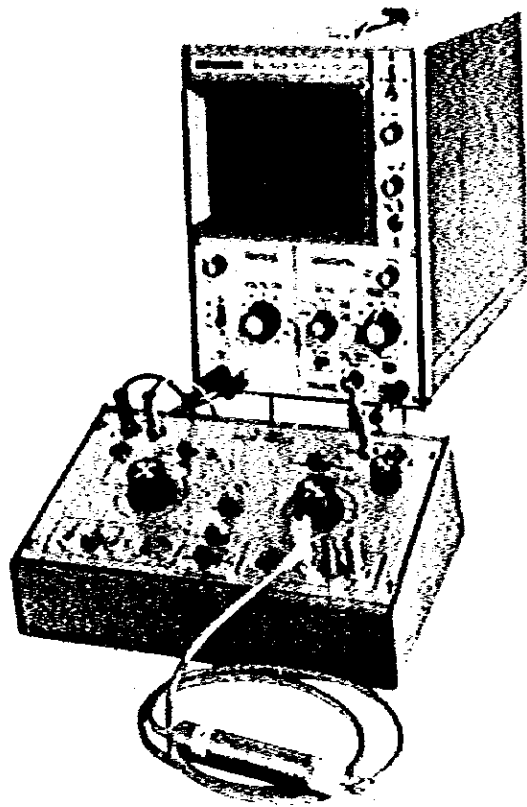
**Oscilloscope (CRT: 5-inch):**

**A set of accessories in a cabinet**

**Remarks:**

**Can indicate the transistor, FET, and diode characteristics directly at the CRT.**

**Can be used in-circuit.**



3-33 IC tester

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Ando Electric                      Type AIC-10	200	4	800

**Specifications:**

ICs tested: operational amplifiers and comparators

DC parameter:

AC parameter:

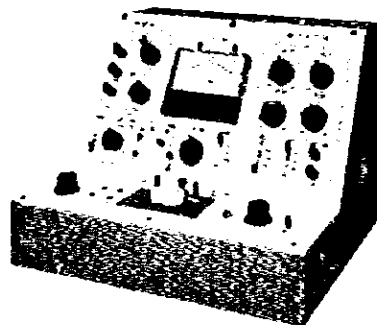
Setting range

V                      : 0 - 20 V                      V                      : 0 - -20 V  
 E<sub>k</sub>, E<sub>c</sub>            : -10 - +10 V            Load : 2, 10 k

Built-in oscillators (for AC tests) : 100 Hz square wave oscillator  
 1 kHz sine wave oscillator

**Remarks:**

Measurement of linear-IC such as operational amplifiers and comparators.





3-34 Transistor checker

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Ando Electric Transistor test set type TCH-12	350	4	1,400

**Specifications:**

Permits two test modes, the in-circuit test and the out-circuit test.

Can measure transistors and diodes regardless of polarity.

**GO/NO-GO test:**

**GO lamps:** Transistors: PNP GOOD, NPN GOOD.  
Diodes: DIODE GOOD.

**NO-GO lamps:** Open; SHORT OR LOW IMP

**H<sub>FE</sub> test:**

**1. In-circuit test:**

**Applied voltage:** less than 2V across emitter and base (1kHz AC, effective value).  
less than 3V across collector and emitter (DC).

**Measurement range:** 5 to 1,000.

**Accuracy:** within  $\pm 15\%$  in comparison with a separate test of a transistor alone.

**2. Out-circuit test:**

**Applied voltage:** V<sub>c</sub> 3V (DC, within  $\pm 10\%$ )  
V<sub>c</sub> 6V (DC, within  $\pm 10\%$ )

**Applied current:** I<sub>c</sub> 20mA (for V<sub>c</sub> 3V)  
I<sub>c</sub> 3mA (for V<sub>c</sub> 6V)

**Measurement range:** 5 to 1,000.

**Accuracy:** within  $(4 + \frac{\text{Indicated value}}{\text{Max. value of range}} \times 6) \%$

**I<sub>c</sub>B<sub>o</sub> test:**

**Applied voltage:** 2 to 150V.

**Measurement range:** 0.03 A to 5mA, 6 ranges

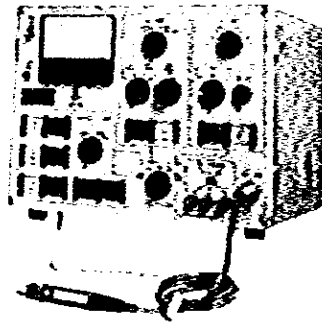
**Accuracy:** within  $\pm 5\%$  of full scale for each range except 0.1  $\mu$ A range.  
within  $\pm 10\%$  of full scale for 0.1  $\mu$ A range.

**Power requirements:** 220V AC, 60 Hz

**Remarks:**

The quality tests of transistors and diodes and the HFE test (current-amplification factor test) of transistors can be done in either mode of the in-circuit and the out-circuit.

IcBo (cutt-off current) of transistors can be measured in the mode of the out-circuit.



3-35 Clamp-on ammeter

Room No. & name of facilities	-			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount	
Fujisoku Clamp-on ammeter type CLA M-103	200	8	1,600	

**Specifications:**

Clamp-on type ammeter

Measuring range: DC 3mA 10A or above Full,  
minimum scale: 3mA full range

Input Impedance: almost 0

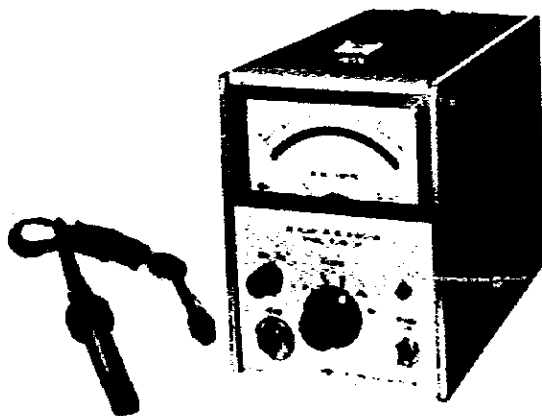
Accuracy: within  $\pm 3\%$

Power source: AC 220V, 60 Hz

**Remarks:**

DC Clamp-on Ammeter

Measuring range: 1mA to 1A or above.



3-36 Q meter

Room No. & name of facilities			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Megro Denpa Sokki                      Type MQ-161	300	4	1,200

**Specifications:**

**Measurement range:**

Frequency: 50 kHz - 50 MHz

Q: 10 - 600

$\Delta Q$ : 0 - 50

C: 19 - 483 pF

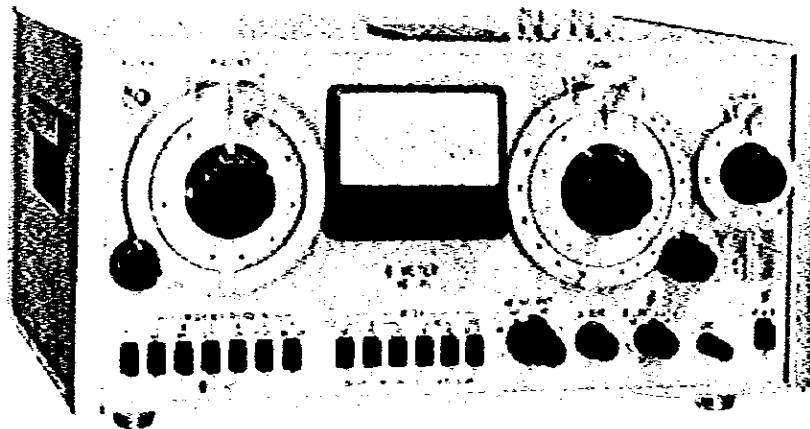
L: 0.1  $\mu$ H - 100 mH (direct reading)

**Accessory:**

coil ..... 1 set

**Remarks:**

All solid-state



**3-37 Oscillator**

Room No. & name of facilities	-			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount	
Megro Denpa Sokki      CR Oscillator type MCR-403	170	8	1,360	

**Specifications:**

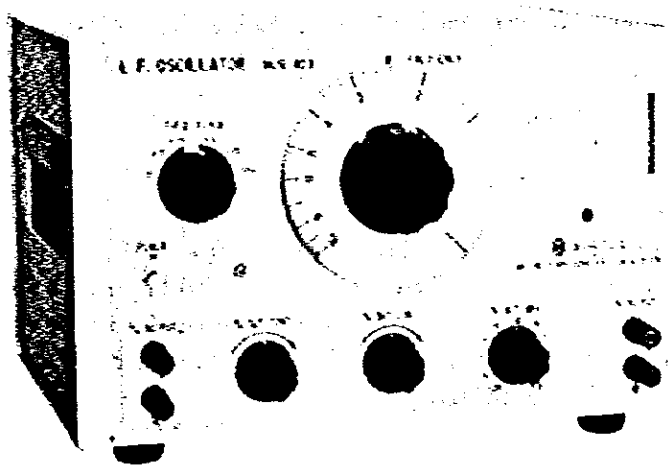
**Frequency range: 5Hz - 1MHz**

**Output impedance: 600**

**Output level:**

**Sine wave: 5Vrms into 600Ω**

**Square wave: 20Vp-p. at open circuit**



**3-38 Oscillator (Standard Signal Generator)**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Anritsu Electric Standard Signal Generator type MG 42A	400	8	3,200

**Specifications:**

**1. Frequency:**

Range: 100 kHz - 50 MHz or above  
 Accuracy: 0.02% 100 Hz or below  
 Frequency calibrator: with a quartz oscillator  
 Frequency stability: after warm-up, within 0.01% in 30-minute period

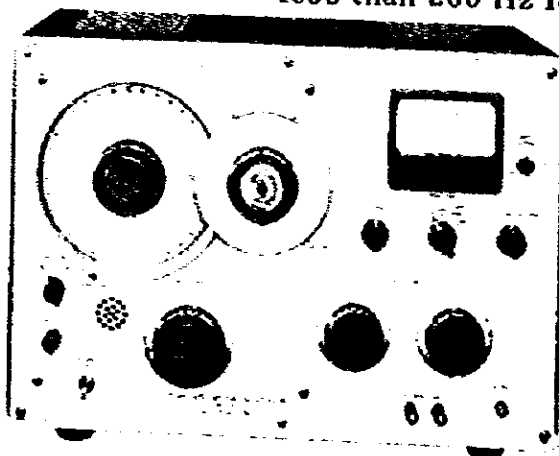
**2. Spurious output: less than -30 dB including secondary harmonics**

**3. Output:**

Level: -10 - 120 dB or above  
 1 dB step  
 Output accuracy:  $\pm 1$  dB  
 Output impedance: 50 $\Omega$ , VSWR, not greater than 1.2:1, BNC connector

**4. Modulation**

Form: AM  
 Internal modulation: 400 Hz, 1kHz 0 - 100%  
 Modulation distortion factor: 30% modulation: less than -40 dB  
 80% modulation: less than -30 dB  
 Incidental FM: 1,000 Hz, 500 Hz or less for 30% modulation (50 MHz)  
 Carrier frequency change: 1,000 Hz (50 MHz)  
 less than 200 Hz for 30% modulation



**3-39 Oscillator**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Leader                      Type LAG-120	35	20	700

**Specifications:**

**Low-Frequency Oscillator: CR type oscillator**

**Low distortion factor: less than 1%**

**Frequency range: wide bandwidth of 30 Hz - 500 KHz or above**

**Output attenuator: switching of 0 -20dB and continuously variable**

**Output voltage: 3Vrms or above**

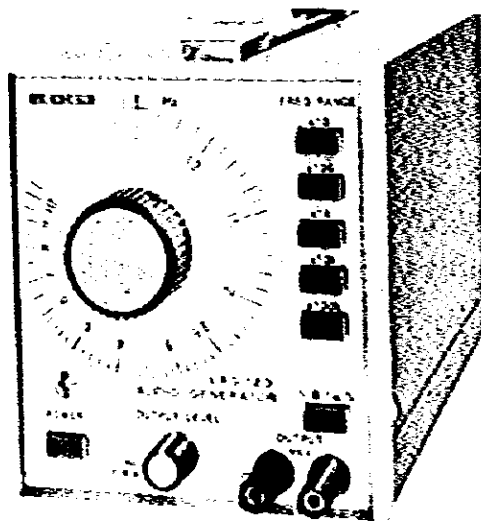
**Sine-wave output and square-wave output can be generated by switching.**

**Output impedance: 600 Ω**

**Remarks:**

**An oscillator of wide bandwidth  
10 Hz to 1 MHz**

**It shall be attached with an output meter, if possible.**



**3-40 Sweep generator (for low-frequency)**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
NF                      Sweep Oscillator type SL-136A	500	4	2,000

**Specifications:**

Frequency range: 0.02 Hz - 100 kHz

Seep width: 1,000 times

Output level: 30V<sub>p-p</sub> max.

Sweep rate:

Linear: 0.01 Hz - 10 kHz/sec.

Log: 0.1 - 100 decade/min.

**Remarks:**

For testing and adjusting amplifiers and audio devices.

Can sweep frequency and output voltage.



**3-41 Sweep generator**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Leader                      Width frequency sweep signal generator type LSW-362	600	4	2,400

**Specifications:**

**Frequency**

Range: 50 kHz - 15 MHz

Accuracy:  $\pm 1\%$

Stability: 0.01% + 100 Hz/ten min. at CW

CW: 50 kHz - 15 MHz

Sweep width: all-band sweep

0 to 10 MHz at the center of optional frequency from

50 kHz to 15 MHz

0-0.3-1-2-5-10 MHz, 6 range switching and continuously variable

Linearity: within 1% of sweep width

Sweep rate: 60 Hz, electric source synchronize, 0.15 - 1.5s,

9 - 90s manual

Output level: 0 dB at 75  $\Omega$  system

Output impedance: 75  $\Omega$  unbalanced

Attenuator: 0 - -100 dBm, 10 dB step

-10 - +3dB, continuously variable

Output accuracy: within  $\pm 1$  dB

Output flat characteristic: within  $\pm 0.3$  dB

Auxiliary output: for recorders and for sweeping a oscilloscope

Marker: 1 MHz, brightness modulation of harmonic marker

**Accessories:**

1. Connector ..... 3 pc.

2. Attenuator ..... 1

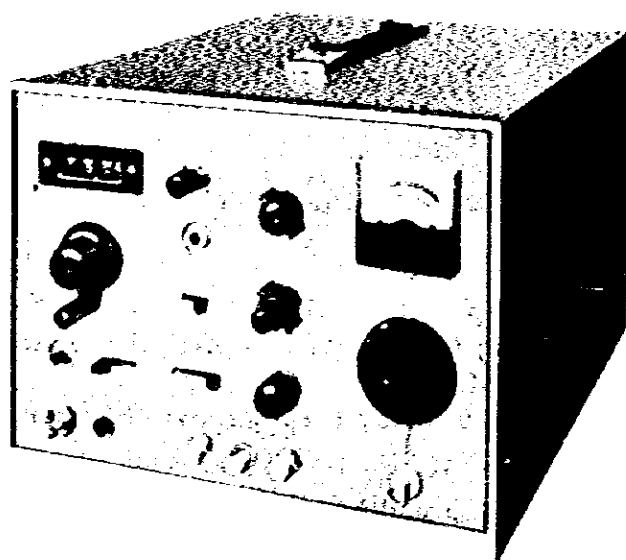
3. Dummy antenna ..... 1

**Remarks:**

**Can sweep wide band high frequency.**

**Digital scale setting of central frequency.**

**Sweep rate: manual operation and low speed suitable for recording.**



**3-42 Pattern generator**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Leader                      LCG-395A	100	4	400

**Specifications:**

**Color system:** specification in situ, PAL/SECAM system

**Color adjusting pattern (color bar) generator**

**High-frequency output:** specification in situ, universal type

**Sync:** crystal control, sequential scanning, specification in situ

**Return circuit elimination:** horizontal and vertical

**Pattern:**

1. Color bar
2. Dot
3. Cross bar
4. Vertical line
5. Lateral line
6. White balance

**Accessories:**

1. RF cable ..... 1
2. Carrying case ..... 1

**Remarks:**

**Pattern generator for adjusting color and monochrome television sets.**

3-42 Oscilloscope

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Iwatsu Electric      Type SS-5215	200	32	6,400

**Specifications:**

Cathode ray tube: 5-inch (130 mm)

Vertical deflection system (at both CH1 and CH2)

Deflection factor: 10 mV/div - 20 V/div

Frequency response: DC - 15 MHz or above

Horizontal deflection system:

Sweep rate: 0.5  $\mu$ s/div - 0.5s/div.

Sweep magnifier: 10 times

Calibrator:

Output voltage: 60 mV, 0.6 Vpp

Single sweep, trigger hold-off, wide range X-Y operation

Accessories:

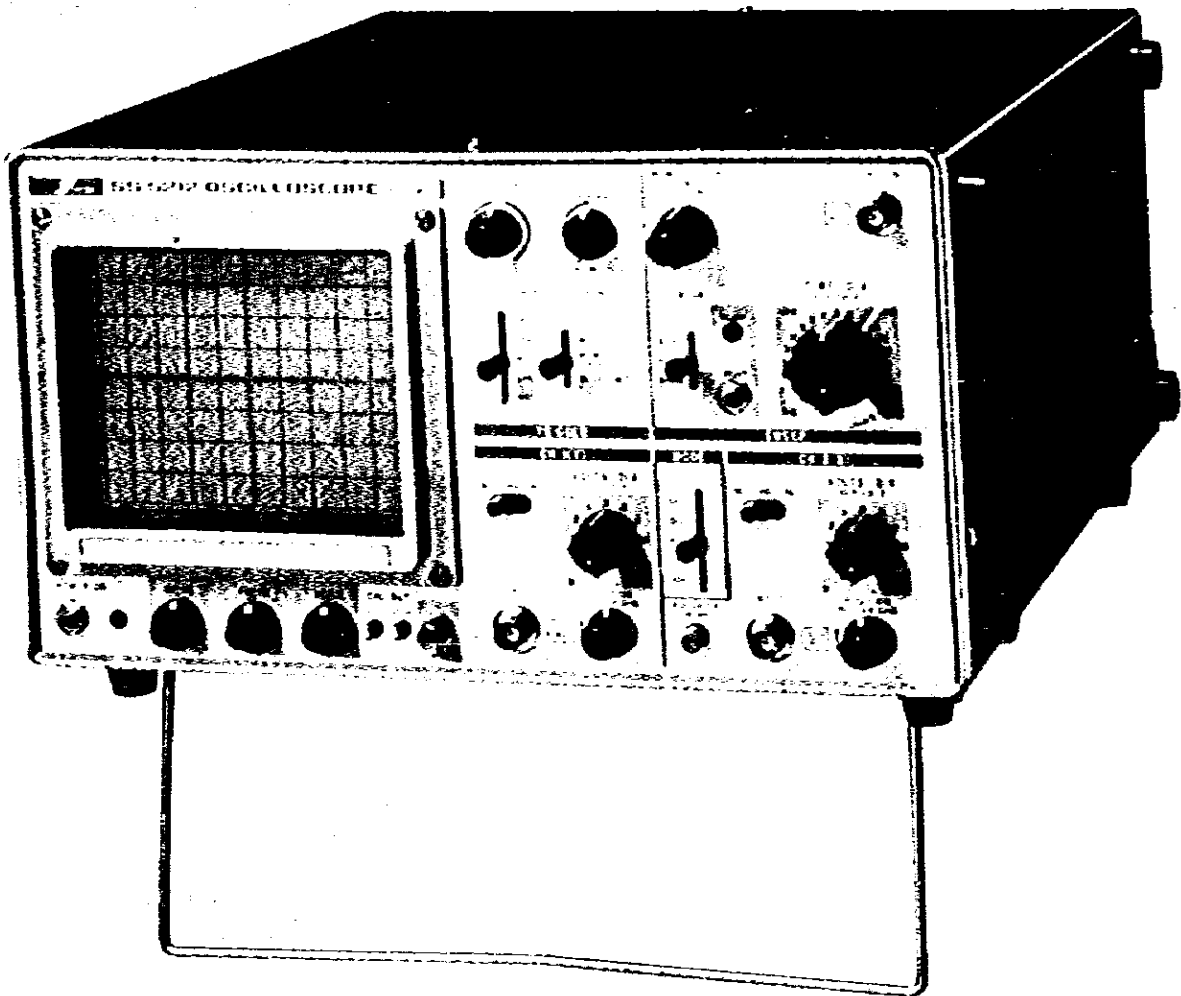
Probe

Scope wagon

**Remarks:**

Dual-trace oscilloscope

Handy type



**3-44 Thin-film vacuum coater**

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

**Specifications:**

**An equipment capable of vapor coating parts of 10 cm or smaller.**

**A set of vacuum pump and vapor coating equipment.**

**Materials for 30 students (aluminum, silver) (base plate: glass, porcelain), vacuum gauge to be included**

**Accessories: operating data sheet - 2 copies**

**materials for exercise: 1set for 30 students**

**Remarks:**

**An equipment capable of vapor coating a pattern of thin film in vacuum. To be handled by students as an exercise.**

**Capable of coating aluminum and silver. Of small size, easy handling and sturdy structure. Preferably encased in a glass container for an easy observation.**

**3-45 Electrolytic plating machine**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	500	1 set	500

**Specifications:**

**A set of an electrolytic plating equipment for small article (copper, nickel, silver, for corrosion prevention)**

**Power source equipment**

**Plating tank**

**Chemicals for 180 students**

**Electrodes ..... 3 sets**

**Capable of plating 10 pieces of metallic plates of 10 cm or smaller size simultaneously. An easy rinsing. Should include small articles for pretreatment and after-treatment.**

**Accessories: Operating data sheet**

**An easy handling by students with no difficult operations.**

**Can be after-treated to avoid public pollution.**

**Treating equipment for chemicals to be installed by the school separately.**

**Remarks:**

**An electrolytic plating equipment for small articles such as knobs and handles. To be devised for an easy handling by laymen.**

3-46 Power unit

Room No. & name of facilities				
Name of manufacturer & type for reference		Unit price	Q'ty	Amount
Trio	Regulated DC power supply type PR-654	50	32	1,600

Specifications:

Regulated DC power supply

DC output: 0 - 15 V or above, 5 A  
continuously variable and the use of transistor or IC

With GND terminal

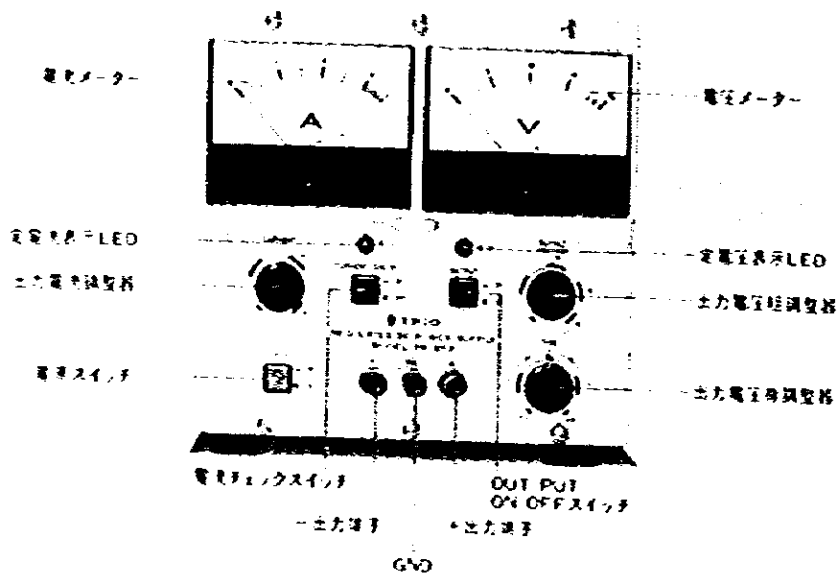
Limitation of current can be made continuously.

Small type

Remarks:

Solid and handy for students' use.

Protection circuit for accidents such as over-load and short-circuit at the output.





**3-47 Eliminator power unit**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Iwatsu                      Type AR-5000	250	6	1,500

**Specifications:**

This unit shall supply each desk with stabilized 100 V and 115 V. Each desk shall be provided with a table tap for sufficient use of measuring instruments for electronic measuring instruments.  
Capacity: 5 KVA  
Power source: AC 220V 60Hz

**Remarks:**

This unit is used to stabilize AC power source voltage to supply each desk with stable 115 V & 100 V.



3-48 Workbench

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
— Worktable		75	2,800
Chair	5	150	750
	(Total)		3,550

Specifications:

Same as No. 2-32

Dimension:

1. 1,000 x 500 m/m	.....	10 set	x 25,000 yen	= 250,000 yen
2. 1,500 x 500	.....	10	x 30,000	= 300,000
3. 1,500 x 750	.....	45	x 40,000	= 1,800,000
4. 1,800 x 800	.....	10	x 45,000	= 450,000

(Total)	75		2,800,000
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**3-50 Rack**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	55	20	1,100

**Specifications:**

Rack-type arranging shelves.  
 Load 300 kg, with 6 shelving boards  
 1,820 W x 460 D x 2,102 H  
 Same as No. 2-33

**3-51 Movable blackboard**

Da 201 Workshop Wireing WII  
 Da 202 Workshop Sheet Metal-1 WII

Room No. & name of facilities	Da 204 Workshop Assembly WII Da 205 Workshop Assembly WII Da 207 Workshop Sheet Metal-2 WII		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	50	5	250

**Specifications:**

Same as No. 2-34

**3-52 Copier**

Room No. & name of facilities	Da 203, 206 Instructor's Office		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	400	2	800

**Specifications:**

Same as No. 1-4

**3-53 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

**3-54 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

**3-55 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

**3-56 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**

**3-57 Taperecorder**

Room No. & name of facilities				
Name of manufacturer & type for reference		Unit price	Q'ty	Amount
National	Portable stereo cassette recorder type RS-466 FDS	60	2	120
	Tape eraser	20	2	40
	Cassette tape (C-60)	0.5	60	30
		(Total)		190

**Specifications:**

**S/N ratio: 45 dB**  
**Frequency: 80 - 10,000 Hz**  
**Wow and flutter: 0.3 %**  
**Built-in microphone**  
**Variable sound monitoring**  
**Tape counter**  
**Built-in FM and AM radio**  
**Built-in speaker and amplifier**  
**Pause button**  
**Line-in monitoring**  
**Automatic adjustable record level**

**Can use AC power source**

**Power source: AC 220V 60 Hz**  
**AC power source cord**

**Accessories:**

1. Tape eraser ..... 1 set
2. Cassette tape (C-60).. 60 pcs.





3-58 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

**3-59 Wires**

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

**Specifications:**

- Vinyl electric wires for wiring: 8, 10, 20, 30 cores ..... each 10 colors
- 0.18, 7 cores: heat-resisting type ..... 10 colors
- 5.5¢ standard wire: ..... 3 colors
- Enameled wire for transformer: 0.1, 0.2, 0.3, 0.5, 0.8, 1.0 m/m
- Tinned electric wire for wiring: 0.4, 0.5, 0.6, 1.0 m/m ... each 100 m x 10 windings
- Electric wire for AC : parallel vinyl line ..... 1,000 m
- F cable ..... 1,000 m
- Shield line ..... 1,000 m
- Empire tube ..... 100 pcs. for each size

**Remarks:**

- Electric wires for wiring
- Electric wires for transformer

3-60 Parts

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

Specifications:

- Iron core and other parts for transformer ..... 70 sets  
(Insulating parts, frames, tapes, etc.)
- Radio parts (for 7-stones super) ..... 70 sets
- Monochrome television set parts including CRT tubes (10 pcs) ..... 70 sets
- Arrow type tip ..... 2,000 pcs.
- Bagworm clip ..... 2,000
- Banana tip ..... 2,000
- Johnson type terminal ..... 2,000
- Bolts and nuts: 3, 4, 5 m/m ..... 10,000 for each
- Egg lug ..... 10,000
- AC consent ..... 100
- Table tap ..... 100
- Vinyl tape ..... 100
- Chassis: every kind ..... 1,000
- Aluminium plate (thickness: 0.8 m/m, 200 x 150 m/m) ..... 100
- Iron bar: 2, 4 cm  $\phi$  x 2 m ..... 30
- 1/4 P:
- 1. 10  $\Omega$  , 22  $\Omega$  , 51  $\Omega$  , 100  $\Omega$  , 220  $\Omega$  , 330  $\Omega$  ..... 3,000 for each
- 2. 470  $\Omega$  , 510  $\Omega$  , 1k  $\Omega$  ..... 5,000 for each
- 3. 1.5 k  $\Omega$  , 2.2k  $\Omega$  , 3.3k  $\Omega$  , 4.7k  $\Omega$  , 5.1k  $\Omega$  , 6.2k  $\Omega$  ,  
6.8k  $\Omega$  , 8.2k  $\Omega$  , 10k  $\Omega$  ..... 5,000 for each
- 4. 15k  $\Omega$  , 22k  $\Omega$  , 33k  $\Omega$  , 39k  $\Omega$  , 47k  $\Omega$  , 51k  $\Omega$  , 62k  $\Omega$  ,  
82k  $\Omega$  , 100k  $\Omega$  , 150k  $\Omega$  , 220k  $\Omega$  , 330k  $\Omega$  , 470k  $\Omega$  ,  
510k  $\Omega$  , 680k  $\Omega$  , 820k  $\Omega$  , 1M  $\Omega$  , 1  $\Omega$  , 2.2  $\Omega$  , 4.7  $\Omega$  ,  
33  $\Omega$  , 820  $\Omega$  ..... 1,000 for each
- 5W: 0.1  $\Omega$  , 0.22  $\Omega$  , 0.3 or 0.33  $\Omega$  , 0.47 or 0.5  $\Omega$  ... 1,000 for each
- 1/4P: 2M  $\Omega$  , 5M  $\Omega$  , 10M  $\Omega$  ..... 500 for each
- Half-fixed resistance, 1/8P:
- 100  $\Omega$  , 300  $\Omega$  , 500  $\Omega$  , 1k  $\Omega$  , 3k  $\Omega$  , 5k  $\Omega$  , 10k  $\Omega$  ,  
30k  $\Omega$  , 50k  $\Omega$  , 100k  $\Omega$  , 300k  $\Omega$  , 500k  $\Omega$  , 1M  $\Omega$ .... 1,000 for each
- 15 - 20 rotary type half-fixed resistance:  
with potentiometer
- 100  $\Omega$  , 300  $\Omega$  , 500  $\Omega$  , 1k  $\Omega$  , 3k  $\Omega$  , 5k  $\Omega$  , 10k  $\Omega$  ,  
30k  $\Omega$  , 50k  $\Omega$  , 100k  $\Omega$  , 300k  $\Omega$  , 500k  $\Omega$  , 1M  $\Omega$ .... 100 for each

24 volume: A and B curves	
100Ω , 300Ω , 500Ω , 1kΩ , 3kΩ , 5kΩ , 10kΩ	
30kΩ , 50kΩ , 100kΩ , 250kΩ , 500kΩ , 1MΩ.....	100 for each A and B
Knob .....	1,000
Pin plug .....	1,000
Pin jack .....	1,000
6P switch .....	3,000
6P middle point-off switch .....	1,000
4-circuit 6-contact rotary switch .....	1,000
Non-lock 4P switch .....	1,000
Relay: 6, 12, 24 V (more than 4 circuits for each) .....	100 for each
Vernier dial: 36 m/m φ .....	100
16P, 14P IC Socket .....	5,000 for each
24P, 40P, 28P IC socket .....	1,000 for each
Crystal: 100 kHz, 1 MHz, 10 MHz, with socket .....	100 for each
Choke coil: 1μH, 5μH, 10μH, 30μH, 50μH, 100μH, 300μH, 5.6 mH, 8.2 mH, 10 mH, 33 mH, 500μH, 1 mH, 3 mH .....	100 for each
16φ Bobbin with socket .....	100 pcs.
Bushing large, middle, small and circular type .....	300 for each
6.5φ stereo jack .....	100
Pulse transformer: TP-1A, SF-2A .....	100 for each
Driver transformer: ST-11, 20, 21, 24, 26, 23, 14 .....	100 for each
2.5φ Plug .....	100
3.5φ Plug .....	100
Lead relay : 6 or 5V, 2-circuit 1-contact ...	100
Transformer:	
Primary: 100, 115 V	
Secondary: 10, 20 V 5 A .....	50
Transformer:	
Primary: 100, 115 V	
Secondary: 220 V 1A .....	20
Angle: 2cm x 2m .....	30
Aluminium angle: L-shaped type, 1,000 x 55 x 10 .....	50
Swelling tip and jack .....	2,000
Flat lug plate: 12P .....	100
Copper plate: 0.3 m/m (thickness) 200 x 150 .....	50
Plastic plate: 3 m/m (thickness) 50 x 50 .....	50
Bake plate: 1m/m (thickness) 10 x 50 .....	50
Bake plate for printing board .....	100
Ceramic condenser: 1P, 3P, 6P, 8P, 10P, 15P, 30P, 68P, 100P .....	5,000
360P, 0.001μ, 0.04μ, 0.01μ, 0.05μ, 0.1μ .....	3,000 for each
Mylar condenser: 820P, 1,000P, 0.047μ, 0.068μ, 0.027μ, 0.1μ, 0.15μ, 0.2μ, 0.33μ, 0.47μ .....	3,000 for each

Polystyrene condenser: 2P, 5P, 10P, 30P, 50P, 100P, 300P, 500P, 0.001 $\mu$ , 0.003 $\mu$ , 0.005 $\mu$ , 0.01 $\mu$ , 0.022 $\mu$ .....	3,000 for each
Oil condenser: 0.001 $\mu$ , 0.005 $\mu$ , 0.01 $\mu$ , 0.03 $\mu$ , 0.05 $\mu$ , 0.1 $\mu$ , 0.22 $\mu$ .....	1,000 for each
MP condenser: 0.01 $\mu$ , 0.022 $\mu$ , 0.033 $\mu$ , 0.047 $\mu$ , 0.068 $\mu$ , 0.1 $\mu$ , 0.15 $\mu$ , 0.33 $\mu$ , 0.47 $\mu$ , 0.68 $\mu$ , 1.0 $\mu$ , 1.5 $\mu$ , 2.2 $\mu$ , 3.3 $\mu$ , 4.7 $\mu$ , 6.8 $\mu$ , 10 $\mu$ .....	1,000 for each
Electrolytic condenser: 1 $\mu$ , 3 $\mu$ , 4.7 $\mu$ , 10 $\mu$ , 22 $\mu$ , 33 $\mu$ , 47 $\mu$ , 100 $\mu$ 220 $\mu$ , 330 $\mu$ , 470 $\mu$ , 1,000 $\mu$ , 2,200 $\mu$ , 3,300 $\mu$ 4,700 $\mu$ , 10,000 $\mu$ F.....	3,000 for each
Ceramic trimmer: 10P, 20P, 6P, 30P, 50P, 40P, 60P, 70P .....	1,000 for each
Radiating fin for T0-5 .....	1,000
Luminous Pi regulator: TLR 103 .....	5,000
TLR 312 .....	1,000
TLR 313 .....	1,000
TLG 312 .....	300
TLG 313 .....	300
SCR: 200 V 1A, 200 V 5A, 200 V 10A .....	300 for each
UJT, PVT: 2SH13, 2SH21, N13H1, N13T1 .....	500 for each
Zener diode: RD4A, 5A, 6A, 9A, 12A, 16A, 24A .....	1,000 for each
Bridge diode: M4C1, 5B2, 6B20, S5188, KBPC2502 ....	1,000 for each
Diode: 1S1588, 10D1 .....	5,000
FET: 2SK30A, MK10 .....	5,000
Photo coupler: TLP 503, TLP 504 .....	1,000 for each
Photo Tr. Di: TPS603, TPS604, TPS701 ...	1,000 for each
Triac: SM2D41, AC02BT, AC06DT, AC10DT .....	300 for each
Tr: 2SA-733, 627, 2SB-56, 471, 2SC-1,000, 536, 2SD-188, 79 .....	1,000 for each
Complementary Tr: 2SA-627, 2SD-188 .....	a pair of 100
Cds: P380-7R .....	100
Voltage regulator: $\mu$ A723, $\mu$ A805, $\mu$ A7812, $\mu$ A7818, $\mu$ A7824, with radiator $\mu$ A7905, $\mu$ A7912, $\mu$ A7915 $\mu$ A7918, $\mu$ A7924 .....	300 for each
OP amplifier: $\mu$ A709C, $\mu$ A741, CA3140 .....	5,000 for each
TTL SN74LS: 123, 136, 175, 90, 92, 93, 00, 47, 04, 40, 11, 30, 14, 257 .....	300 for each
366, 367, 91 .....	100 for each
TTL SN74: 154, 07 .....	100 for each
MM74C: 00N, 04N, 20N, 175N, 90N, 93N ....	100 for each
Others:	
MC 3408, 8700CJ .....	100 for each
PD2102ALC-4 .....	800 (with 16P IC socket)
MC8T26, MC8T96 .....	100 for each
NE566V, NE555 .....	60 for each
Power source transformer:	
Primary: 100, 110V, Secondary: 10, 14, 16V 2A .....	50

IC printing board: standard size ..... 300

**Remarks:**

**Iron core for transformer**

**Parts for radio set**

**Parts for television set**

**Others**

**Classify the parts in-to the parts box.**

**3-61 Preparatory tools**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	100	5	500

**Specifications:**

- Wire strippers: large and small
- Adjustable angle wrench
- Pipe wrench
- Screw drivers:
  - For wiring: small type
  - For electric work: large and middle
- Phillips screw drivers:
  - For wiring: small
  - For electric work: large and middle
- Nut drivers: 3 - 10 m/m ..... 1 set
- Steel saw edge
- Marking-off needle
- Punch
- Hammer:
  - Iron hammer: large and small
  - Plastic hammer: ditto
  - Wooden hammer: ditto
- Pliers
- Cutting pliers } for electric work
- Knife }
- Tweezers
- Automatic screw driver
- Automatic phillips screw driver
- Radio pliers
- Hand drill
- Bench vice: 50 mm



**Tinman's shears**

**Files: flat, semi-round, round**

**Soldering iron**

**A complete set of small articles for soldering**

**Steel scale: 30 cm**

**Remarks:**

**Wiring tools, Tools for plate work**

**Tools for machine preparation and maintenance**

**Tools equipped in a preparatory room**



## **4. Electronics I**

**Cost of equipment :**

**price Thousand Yen : 160,228**

**price US \$ : 821,682**



**4-1 DC circuit experimental unit**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Kimura Electric      Type ST-101A	95	32	3,040

**Specifications:**

Resistance element: 10, 20, 30, 50, 100Ω..... three for each  
 Flash lamp element: 3.8 V ..... 4 pcs.

DC voltmeter: JIS C 1102 2.5 class, 1/3/10 V

DC ammeter: JIS C 1102 2.5 class, 0.3/1/3 A

Circuit panel: with a set of leads

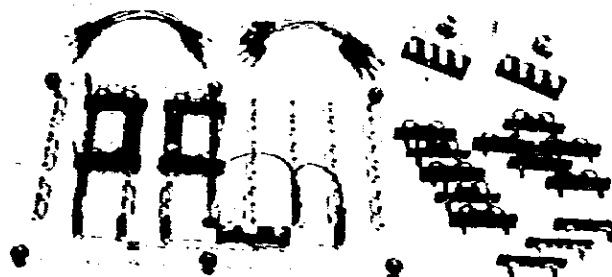
Power source: DC 4 V, three 1.5 V dry cells (JIS C 8501 type UM-1 or equivalent)

Case ..... 1

**Remarks:**

**Contents of training:**

1. Measurement of voltage and ampere
2. Experiment of Ohm's law
3. Practice of the serial and parallel connection of resistance
4. Measurement of resistance by voltage drop



#### 4-2 DC potentiometer

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Kimura Electric Works	100	17	1,700

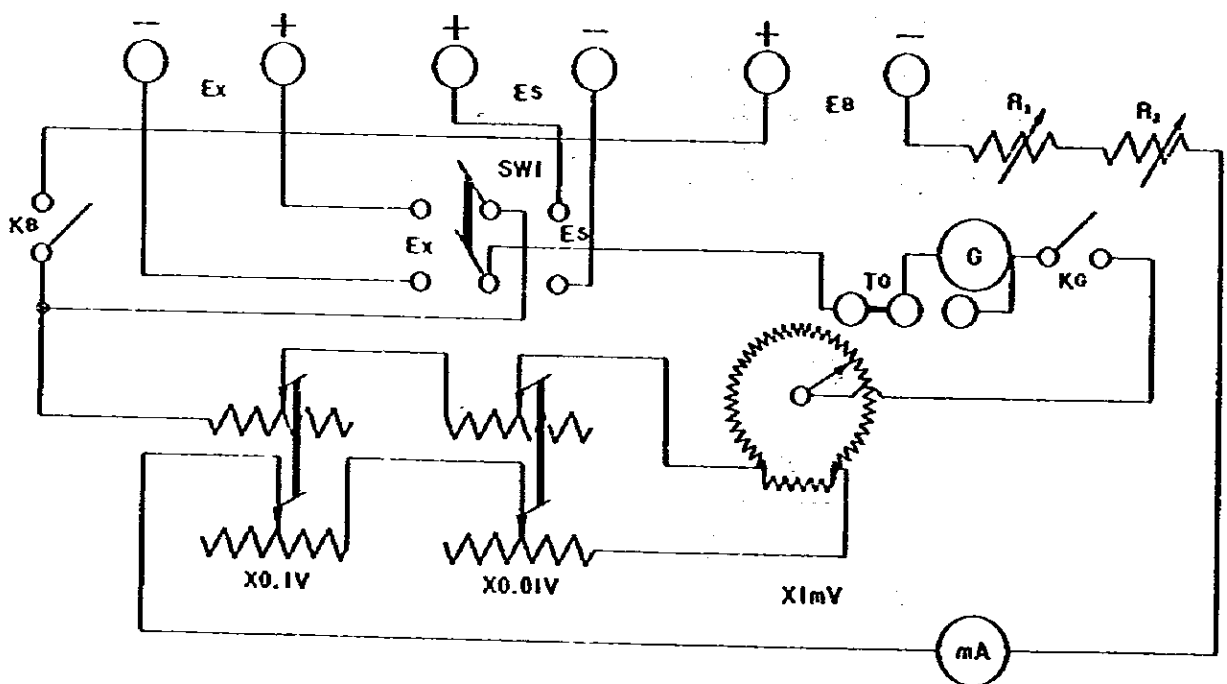
#### Specifications:

Exploded type DC potentiometer for easy understanding of the principle of the potentiometer

Terminals for internal wiring by students

Resistance value dial:  $R: 10\Omega = 1V$   
for measurement of more than 2.5 V

Galvanometer (inclined type) ..... 1 set  
 Dry cell: DC 2 - 4V ..... 6 pcs.  
 Standard cell ..... 1  
 Mercury cell ..... 1





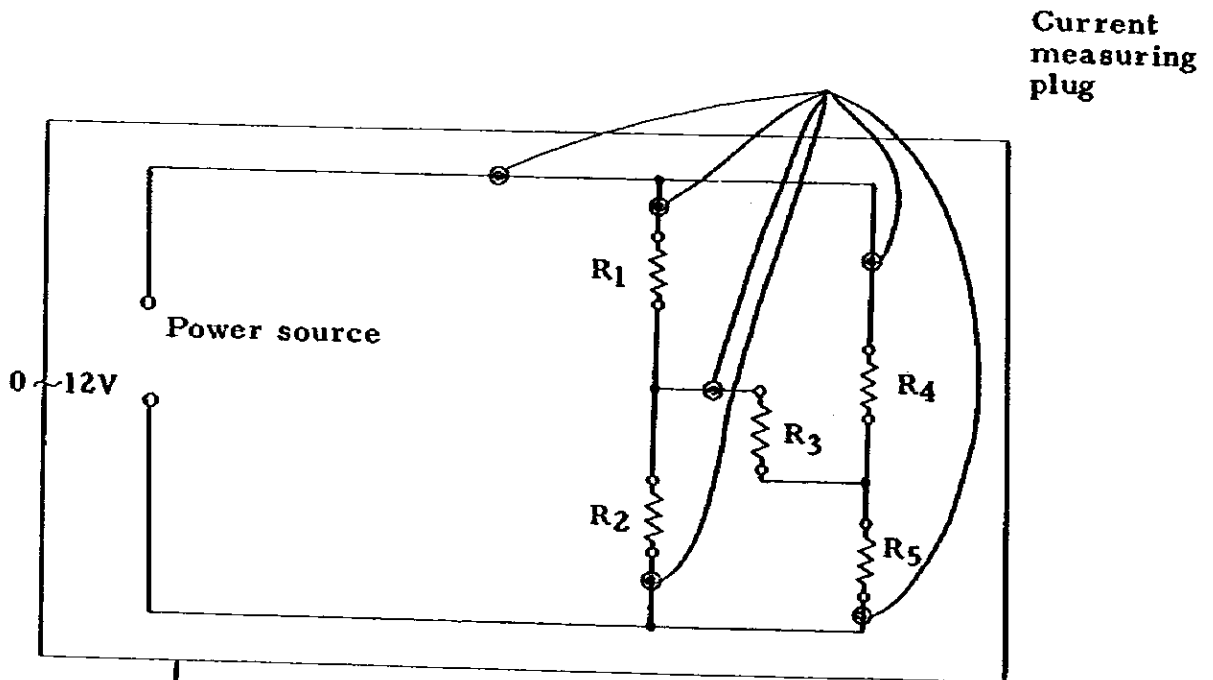
### 4-3 Experimental network unit

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

#### Specifications:

1. Bridge type circuit network: resistors are replaceable.
2. Case with a lid: having a circuit
3. Power source: AC and DC 0 - 12 V
4. Resistor: less than 1% 10 W 1 - 10 2 for each ..... 20 pcs.  
     Plug-in type 10 - 100 2 for each ..... 20
5. Voltmeter: 1.5, 5, 15 V ..... 1
6. Ammeter: 0.05, 0.1, 1 A ..... 1
7. Lead wire for voltmeter  
     Lead wire for ammeter

#### Circuit network:



Copper plate: surface wiring



#### 4-4 Experimental bridge unit

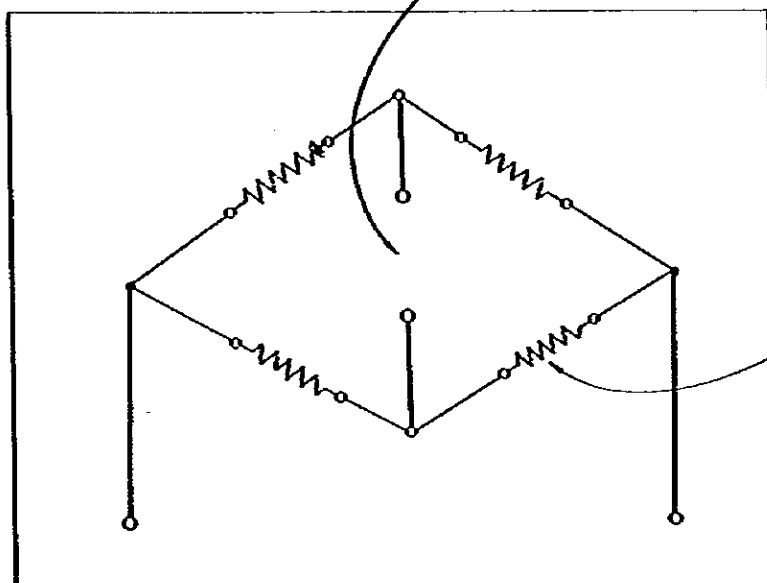
Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Kimura Electric Works	50	32	1,600

**Specifications:**

1. Resistor: 1 % more than 3 W (plug-in type)
  - 1 - 10 Ω: 2 for each ..... 20 pcs.
  - 10 - 100 Ω: 2 for each ..... 20
  - 100 - 1000 Ω: 2 for each ..... 20
2. Variable resistance box with five dials: 1 - 1000 Ω or above
3. Case with a lid having circuit
4. Lead wires for voltmeter and ammeter: the same lead wires as those of No. 4-3
5. Power source: dry cell
6. Unknown resistors: various resistances without names ..... 10 pcs.

Circuit Diagram: the case and lid with circuit on its under-side.

Galvanometer connection terminal



The resistance box can be connected,

Copper plate: surface wiring

**Remarks:**

**Bridge circuit experimental apparatus  
with plug-in type resistors (same as those of No. 4-1)**

**Small type terminals to connect general measuring instruments.**

#### 4-5 Bridge circuit unit

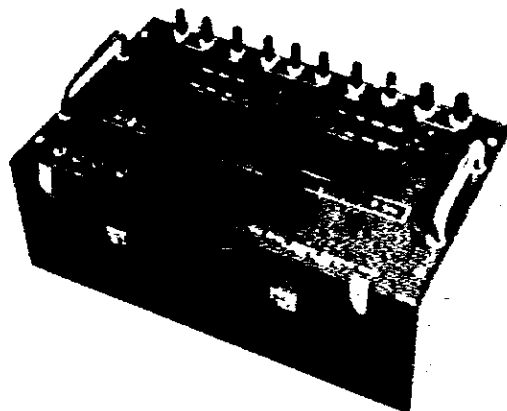
Room No. & name of facilities	-			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount	
Shimadzu Scientific Instrument      Wheatstone bridge type BD-30	20	12	240	

#### Specifications:

DC bridge (simple type) having no galvanometer and dry cells.  
- Instruction Manual (Eng., Jap.) - Inspection Report

#### Remarks:

Use a simple bridge with a galvanometer as an option.  
This galvanometer can be used in common with the apparatus of No. 4-4.



**4-6 Experimental Joule's heat unit**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Shimadzu Scientific Instrument      Water Calorimeter type JK-100	6	17	102

**Specifications:**

Copper container: 200 ml

Resistance wire: 2  $\Omega$  and 3  $\Omega$  , two kinds

Thermometer: 2

Power source: AC or DC 6 V

Case with a transparent plastic lid and a stirrer

**Accessories:**

Thermometer ..... 2

Resistance wire ..... 2

- Instruction Manual (Eng., Jap.)

- Inspection Report

**Remarks:**

This apparatus can be used for Joule's heat measurement.



#### 4-7 Thermocouple equipment

Room No. & name of facilities	-			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount	
Shimadzu Scientific Instrument Thermister thermometer type TH-150	20	17	340	

#### Specifications:

Thermocouple: varous kinds of 3 sets

Ammeter: DC 0.5/1 mA

Thermometer: mercury thermometer ..... 3

Small water tank : 500 ml ..... 3

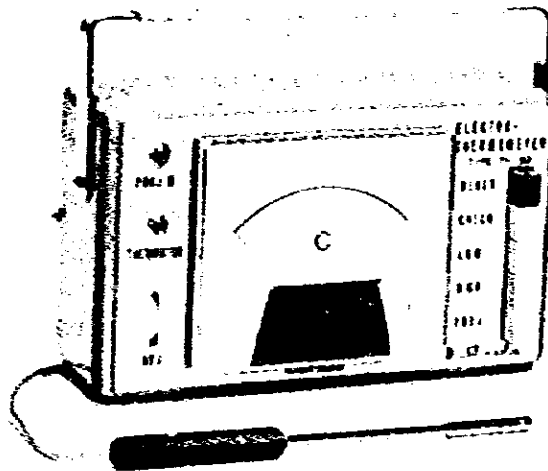
Electric heater: 300/600W ..... 1

#### Accessory:

Nichrome wire for the electric heater

#### Remarks:

An experimental apparatus to detect thermoelectric effect by temperature difference and to study it ellectrically by a measuring instrument.



**4-8 Magnetic field demonstration unit**

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

**Specifications:**

- Bar magnet ..... 3 pcs.
- U-shaped magnet ..... 3
- Tonner for copier ..... 1 can with a small sieve
- Coil bobbin ..... 1,000 turns
- Electromagnet with iron core:
  - Bar type and gap and core type with ring core  
(I core type can be used.) ..... 2 for each
- Self-contained case
- Small electric heater: with spare nichrome wire

This is an experimental apparatus for synthesizing OHP magnetic field to show the magnetic field generated by a coil by means of the projection of the pattern of iron dust confined with paraffin in a tank.

Electromagnetic induction field

**Remarks:**

To show the line of magnetic force of a permanent magnet and an electromagnet to demonstrate the difference and similarity of both magnets.

To show line of magnetic force by current.

**4-9 Magnetization testing equipment**

Room No. & name of facilities	-			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount	
Yamabishi Electric                  Type YEXL-1	80	32	2,560	

**Specifications:**

**Iron core for testing: for transformer, communication and general use ..... 3 sets**

**Coil for testing: Primary and secondary coils  
Number of turns: 500 (primary), 500, 40, 20,  
with tap (Secondary)**

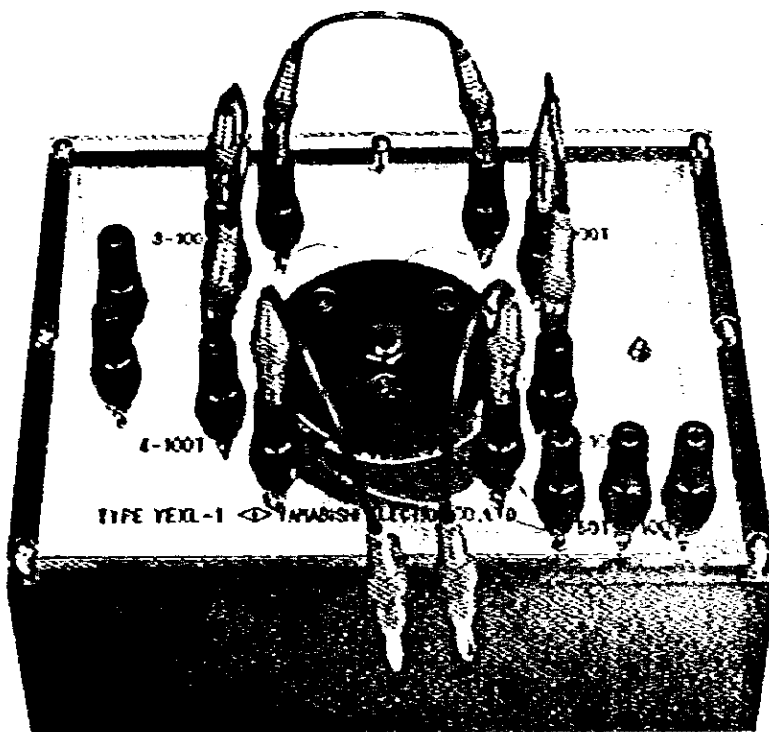
**Change-over switch: double-pole changeover type**

**Slide resistor: 100  $\Omega$  , 2A**

**Gauss meter: flux density measurable instrument (with Wb graduation)**

**Remarks:**

**Can measure B-H characteristics and draw B-H curve.**



**4-10 Magnetization curve display unit**

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

**Specifications:**

Can draw a hysteresis loop on the CRT screen of the oscilloscope for the direct viewing of magnetizing characteristics.

Oscilloscope: 130 m/m

Hysteresis measuring and detecting apparatus: 1

The magnetic material must be able to be changed, and it must be observed quantitatively by graduation.

**Remarks:**

For measuring magnetic materials by a hysteresis scope.

Consist of an oscilloscope and measuring instruments.



#### 4-11 Electromagnetic force testing equipment

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Shimazdu Scientific Instrument      Electromagnetic force demonstrator type DI-1	9	17	153

**Specifications:**

Maximum current: DC 5 A

Minimum sensitivity: 5 mg weight

Length of the wire: 40 cm

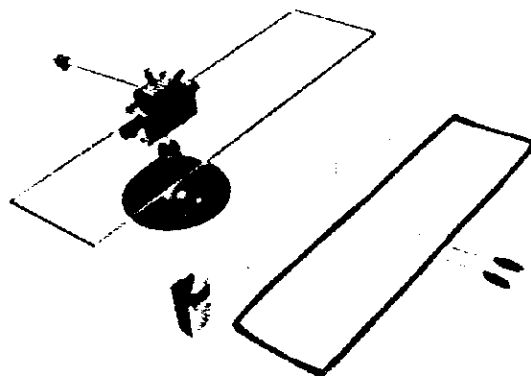
With a reflecting mirror, a magnet to produce magnetic fields and a coil for flux of electric current (10T)

Case ..... 1

**Remarks:**

This apparatus can be grasped intuitively the force exerted on a wire carrying an electric current by a magnetic field, by means of a current balance.

The mutual force exerting between wires carrying electric current can be measured.



**4-12 Electromagnetic induction testing equipment**

Room No. & name of facilities				
Name of manufacturer & type for reference		Unit price	Q'ty	Amount
(1) Shimazdu Scientific Instrument	Electromagnetic Induction Experiment kit type EI-5	20	17	340
	DC recording timer type TI-1	3	17	51
	Galvanometer type HQ-30	8	17	136
(2) Uchida Yoko	Primary & Secondary coils type TF-M	15	17	255
		(Total)		782

**Specifications:**

**Coil: 1,000 turns** A terminal is provided every 100 turns.

**Inner diameter of the coil: 40, 60 and 80 mm**

**Speed reducing pulley: two kinds of 1:2 and 1:5**

**With weight case (with string), stopper and magnet**

**Iron stand**

**Recording timer**

**Primary coil: 200 turns**

**Secondary coil: 500 turns (with intermediate taps)**

Soft iron wire bundle ..... 1

6 V miniature lamp with socket ..... 1

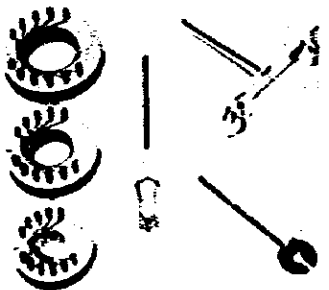
Coil with a miniature lamp ..... 1

Ring ..... 1

**With case**

**Remarks:**

Can make quantitative experiments on electromagnetic induction on the basis principles of mechanics.



**4-13 Static electricity testing equipment**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Uchida Yoko                      Electrostatics kit	40	17	680

**Specifications:**

**Friction rod:**

Glass rod: 10  $\phi$  x 200 mm ..... 1

Ebonite rod: 10  $\phi$  x 200 mm ..... 1

**Electrifying clothes:**

Cotton ..... 2

Woolen ..... 2

Friction rod stand

Electrical pendulum

Leaf electroscope

Graduated electroscope

Leyden jar

Discharger rod

Insulating platform

**4-14 Discharge phenomena observation equipment**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Shimadzu Scientific Instrument Tesla's high frequency current apparatus type TE-1	74	12	888

**Specifications:**

A high-voltage high-frequency generator with circuit comprising a Leyden jar, discharge electrode, tesla transformer and a pair of discharge rods.

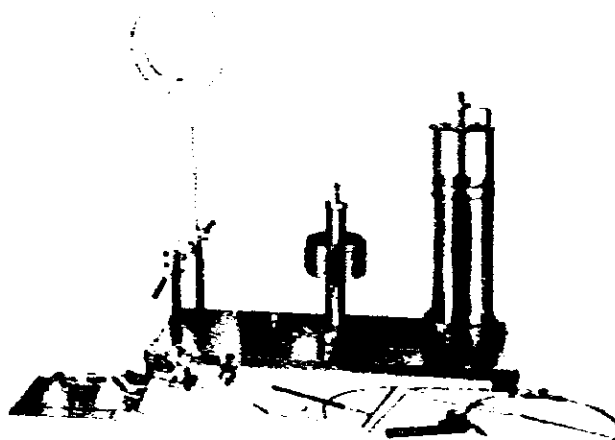
**Accessories:**

- Corona generating rings (large and small) . . . . . one of each
- Two parallel rods for use with rings
- A U-shaped wire for use in impedance phenomenon test
- A copper spiral with lamp
- A copper wire with lamp
- A copper bar
- Two metal plates for the electric field
- A Tesla's nonpolar vacuum tube

With case

**Remarks:**

For discharge phenomena observation



4-15 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. 3-43

#### 4-16 AC basic circuit experimental unit

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Kimura Electric Works	200	16	3,200

#### Specifications:

An equipment capable of displaying vector as oscilloscope picture for learners of the textbooks.

AC power source: 0 - 30 V, 1 A, 50 Hz - 100 Hz variable

Load:

Resistance: 1 - 30  $\Omega$  variable, 1  $\Omega$  step, 0.1  $\Omega$  step.

Inductance: 0.1 H - 10 H variable, 0.1 step, 1 step

Condenser: 0.01 - 10  $\mu$ F variable, 0.01, 0.1 1 step

Accuracy: within 5 %

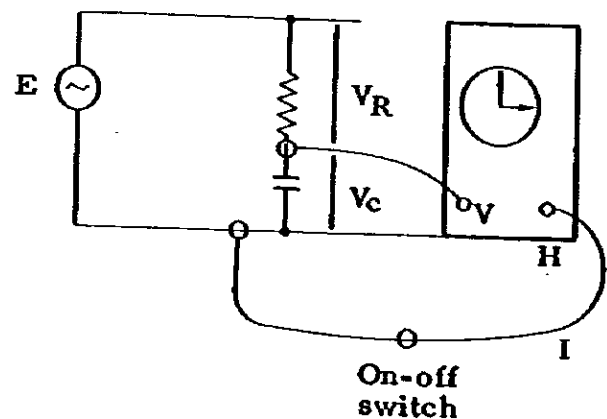
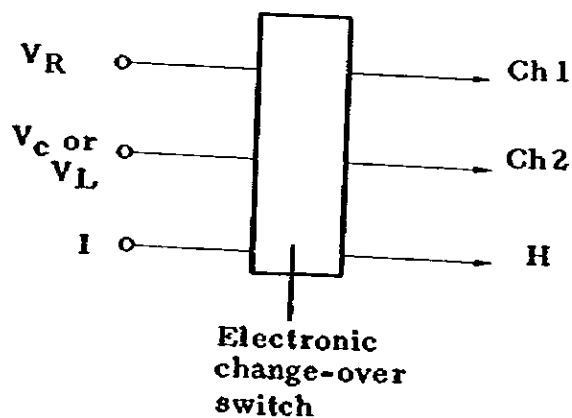
#### Oscilloscope

Probe terminal for oscilloscope current (clamp on type)

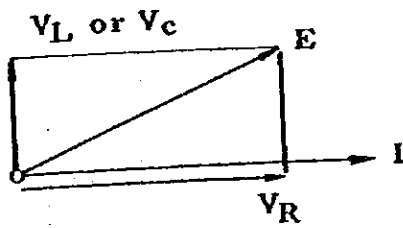
Probe for voltage measurement

Permitting distribution to 17 tables and vector display on oscilloscope. Should have built-in automatic switch for alteration of measured amount and display on oscilloscope.

Display of voltage, current and phase difference is preferred.



**Display Method:**



**Remarks:**

**An equipment allowing easy experiments on fundamental practice in single phase alternating current circuit.**

**With devices for observing phase and vector measurements.**

**To be devised for combined use with No. 4-18.**

4-17 AC bridge circuit unit

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Megro Denpa Sokki Universal bridge type MZ-827	130	17	2,210

Specifications:

Measuring range:

- C: 1pF - 110  $\mu$ F
- L: 1 $\mu$ H - 110 H
- R: 0.1  $\Omega$  - 11M $\Omega$
- D(1kHz): 0 - 10
- Q(1kHz): more than 0.1

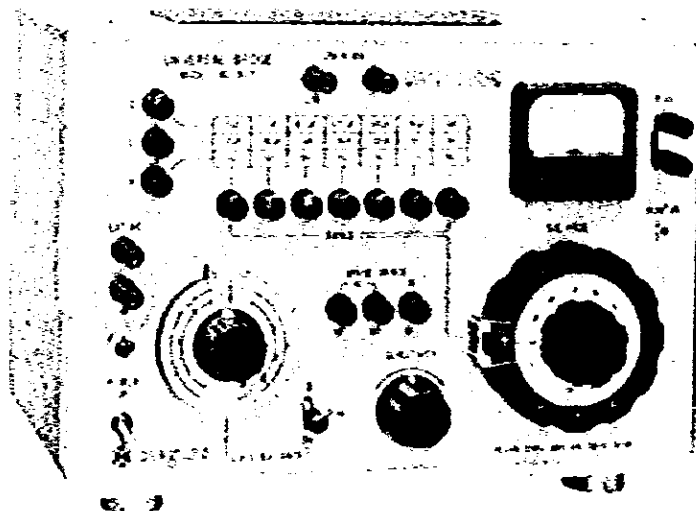
Bridge power source:

- AC: 1,000 Hz
- DC: 0 - 350 V, 1A

Power source: AC 220 V, 60 Hz

Remarks:

Can measure L if DC is contained.





**4-18 Three-phase AC experimental unit**

Room No. & name of facilities	--		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Kimura Electric Works	600	16	9,600

**Specifications:**

**Power generator: 0 - 30V, 2A or larger, 50 - 100 Hz, continuously variable,**

**a-Phase: as standard, b-phase:  $-120^{\circ} \pm 30^{\circ}$  variable**

**c-phase:  $-240^{\circ} \pm 30^{\circ}$  variable**

**Load resistor: 3 - 300  $\Omega$  three-phase load,  $\Delta$ , Y connection: possible**

**Reactor: 0.5 - 3H - ditto -**

**Capacity: 0.5 - 10 $\mu$ F - ditto -**

**- not necessarily be variable continuously.**

**Voltmeter: 3, 10, 30 V ..... 3 sets**

**AC clamp-on ammeter: 0.1, 1, 3 (A)**

**The master panel shall be equipped with a voltmeter, ammeter and phase meter. Capable of vector display on CRT-tube. Digital display of voltage, current and phase is preferable.**

**Power source: 380V AC, 60 Hz, three-phase, 4-lines**

**Remarks:**

**A master source of three-phase alternating current for student exercise. Wiring to 12 - 17 benches in groups.**

**Can be used in combination with the single-phase basic exercise equipment (No. 4-16).**

#### 4-19 Pulse circuit experimental unit

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Iwatsu Electric Pulse circuits trainer type ITf-03	300	17	5,100

#### Specifications:

The following contents of training can be performed by handling the elements on the panel:

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)

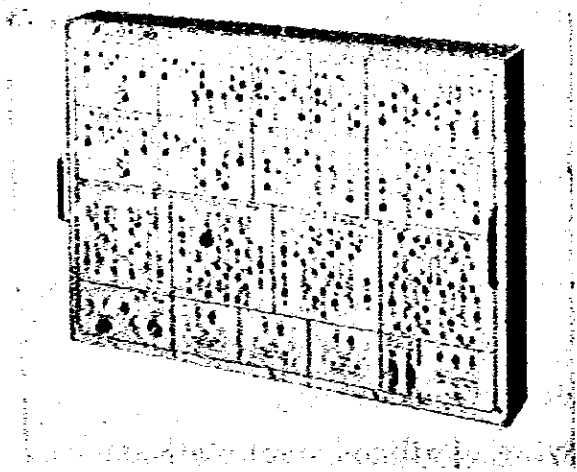
Since each circuit element is indicated graphically on its panel, the elements can easily be understood.

Since each circuit is provided with input/output terminals, the connection between circuits is possible, and various combination can be made.

Power source: 220 V, 60 Hz

#### Remarks:

This apparatus is provided with each circuit element and signal source on its panel so that training can easily be performed from the foundation to the application of pulse circuits, and it can be studied visually by combining them.



#### 4-20 Transformer experimental arrangement

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Shimazdu Scientific Instrument      Electromagnetic phenomena demonstration outfit type EF-4	73	12	876

#### Specifications:

Equipment includes a transformer.

Core: made of layers of silicon steel plate

Coils: a 23,000 T coil (for high voltage transformer)  
a 500t coil (with intermediate tap)  
a 250 T coil and a 50 T coil (with 6 taps)

Consists of a low-frequency furnace, electric welder, repulsion type volt-ammeter, two types of Thomson's Ring, high voltage discharge electrode (stand provided) and the Oersted's tesl lead

With Case

#### Remarks:

Various kinds of experiments utilizing electromagnetic induction such as high voltage discharge repulsion, electric welding, Thomson's Ring, etc. can be carried out.

Can be assembled and disassembled easily.



4-22 DC ammeter

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Yokogawa Electric Works      Type 2011	20	150	3,000
Shimazdu Scientific            Type HQ-5 Instrument	7	150	1,050
	(Total)		4,050

**Specifications:**

Moving coil type

Class: based upon JIS (Japanese Industrial Standard) C 1102

0.5 class ..... 150 sets  
 2.5 class ..... 150 sets (with inclined plastic bases)

Range:

3/10/30/100  $\mu$ A..... 30 sets  
 10/30/100/300  $\mu$ A..... 30  
 1/3/10/30 mA..... 30  
 10/30/100/300mA..... 30  
 1/3/10/30 A..... 30

(Total) 150 sets

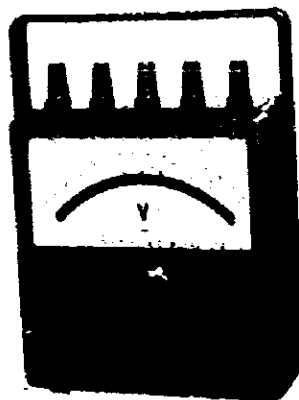
Taut band suspension mechanism

Must be sturdy

**Remarks:**

2.5 class DC ammeter on panel display with inclined plastic base ..... 150 sets

0.5 class precision DC ammeter suitable for the practice by students ..... 150 sets



4-23 DC voltmeter

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Yokogawa Electric Works      Type 2011	20	150	3,000
Shimazdu Scientific              Type HQ-300 Instrument	7	150	1,050
	(Total)		4,050

Specifications:

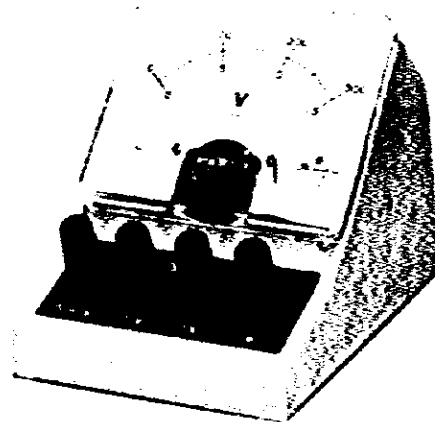
Moving coil type

Class:

JIS C 1102      0.5 class ..... 150 sets  
                          2.5 class (with inclined plastic bases) .... 150 sets

Range:

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



4-24 AC ammeter

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Yokogawa Electric Works      Type 2013	16	150	2,400
Shimazdu Scientific              Type HQ-10 Instrument	7	150	1,050
	(Total)		3,450

Specifications:

Moving coil type AC ammeter with rectifier

Class:

JIS C 1102, 0. class ..... 150 sets  
 2.5 class (with inclined plastic bases)..... 150 sets

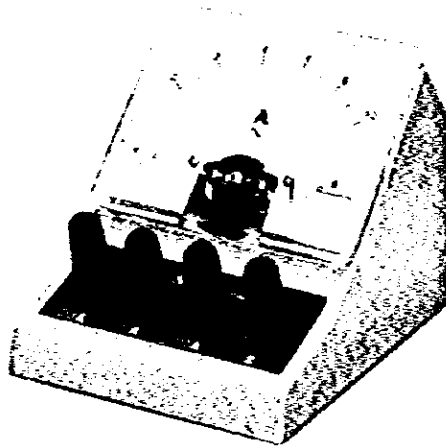
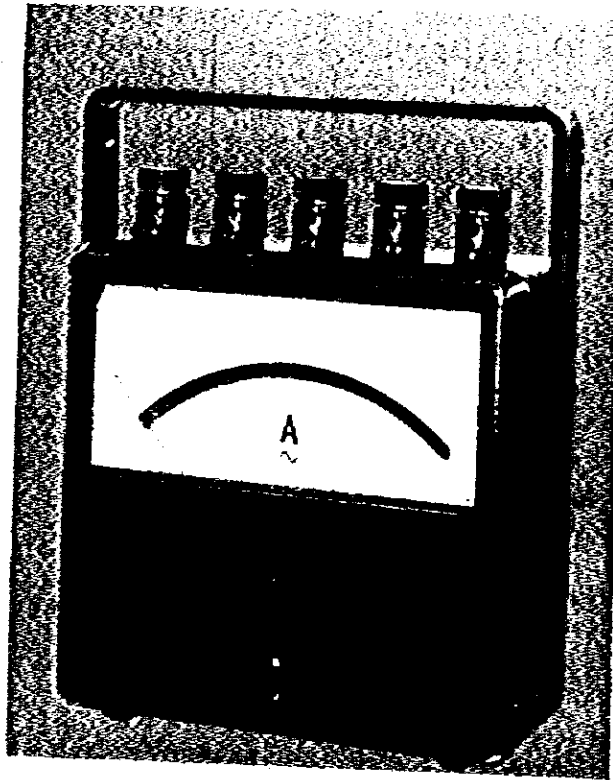
Frequency range: 45 - 65 Hz

Range:

20/100      mA ..... 30 sets  
 100/500    mA ..... 30  
 0.2/1       A ..... 30  
 1/5          A ..... 30  
 5/25        A ..... 15  
 10/50       A ..... 15

Remarks:

For precision type ..... 150 sets  
 For switchboard ..... 150  
 Sturdy and handy for students' use







**4-26 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

4-27 Electronic voltmeter

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Kikusui Electronics Corporation      Type 1633	100	32	3,200

**Specifications:**

AC millivoltmeter

Measuring range: 0 - 1.5 mV - 500 V

Accuracy:  $\pm 3\%$  of full scale

Wide scale for easy reading

AC frequency response: 20 Hz - 1MHz

**Accessories:**

Power source cord ..... 1

Terminal board ..... 1

**Remarks:**

Shall have more than six ranges and each wide scale for easy reading.



4-28 Digital circuit tester

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Iwatsu Electric                      Type VOAC 737	150	17	2,550

**Specifications:**

Measuring function: ACV, DCV,  $\Omega$  , ACA, DCA

Maximum display: 1,999

Automatic range switching

Resolution: 1mV, 1  $\Omega$  , 0.1 mA

Allowable input voltage:  $\pm$ 1,100 VDC

Power consumption: 1.4 W

Power source: two-power source system



4-29 Circuit tester

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	20	34	680

Specifications:

Same as No. 3-21

4-30 Phase meter

Room No. & name of facilities			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Megro Denpa Sokki      Type MPM-553	90	17	1,530

Specifications:

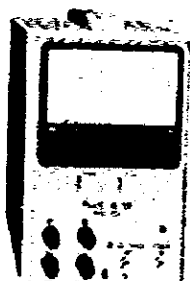
Minimum input voltage: less than 50 mV

Phase angle measurement range: 0 - 180° with lead and lag indication

Frequency measurement range: 20 - 30 kHz or higher

Maximum input voltage: more than 5 V

Input impedance: more than 1 kΩ, 25 pF in shunt



4-31 Galvanometer

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Yokogawa Electric      Type 2708	9	32	288

Specifications:

1. Current sensitivity: more than  $0.9 \mu\text{A}/\text{div.}$   $\pm 10\%$
2. Voltage sensitivity: more than  $540 \mu\text{V}/\text{div.}$   $\pm 15\%$
3. External critical resistance: about  $450 \Omega$



4-32 Galvanometer

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Yokogawa Electric      Type 2707	25	17	425

**Specifications:**

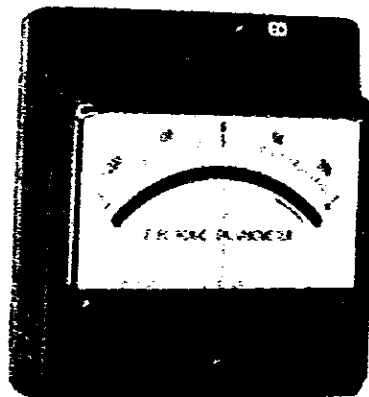
This galvanometer employs a DC amplifier.

1. Maximum sensitivity:  $10\mu\text{V}/\text{div.} \pm 10\%$
2. Input resistance: approx.  $9\text{k}\Omega$
3. Drift: less than  $1\mu\text{V}/\text{hr}$

With overload protection circuit

**Remarks:**

This electronic galvanometer must be equipped with a protection circuit.





4-33 Flux meter

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Yokogawa Electric Works      Electronic flux meter type 3254	60	17	1,020

**Specifications:**

Measuring range:  $0 \sim \pm 1 \times 10^2 \sim 10^5$  kilo-Maxwell Turns

Accuracy:  $\pm 1\%$  of full scale length

Input Resistance:  $2k \Omega$  in  $1 \times 10^4$  kilo-Maxwell Turns range  
 $6k \Omega$  in  $3 \times 10^2$  to  $3 \times 10^3$  kilo-Maxwell Turns range  
 $20k \Omega$  in  $1 \times 10^4$  kilo-Maxwell Turns range  
 $60k \Omega$  in  $3 \times 10^4$  kilo-Maxwell Turns range  
 $200k \Omega$  in  $1 \times 10^5$  kilo-Maxwell Turns range

Drift: less than  $\pm 1\%$  of full scale length

**Accessories:**

Search Coil: No. 1 - No. 3

Power source: four 1.5V dry cells (JIS C 8501 type 006P or equivalent)

**Remarks:**

Sensitivity to 2 kilo-Maxwell Turns/div.

Stable, accurate measurements through quick and simple operation

Output to X-Y recorder for recording B-H curve



**4-34 Thermistor type thermometer**

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Yokogawa Electric Works	45	17	765
Protoble Thermistor thermometer type 2672			
Thermistor probes type 2673	13	17	221
	(Total)		986

**Specifications:**

Measuring range: -50°C to 300°C

Accuracy : ±0.5% of measuring range

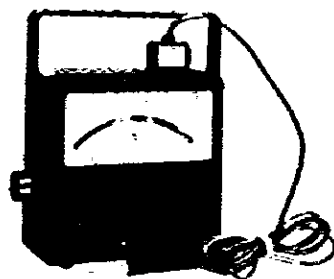
With thermistor probe (glass tube with protection tube)

**Accessory:**

9V dry cells .....6 pcs.

**Remarks:**

Precise measurement of temperatures up to 300°C



**4-35 Demonstration galvanometer**

Room No. & name of facilities			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Shimazdu Scientific Instrument      Type DG-30	38	2	76

**Specifications:**

**Suited for demonstration experiment**

**Upright type**

**Maximum sensitivity on 50 side of coil: within 0.5 mA  
and within 25 mV**

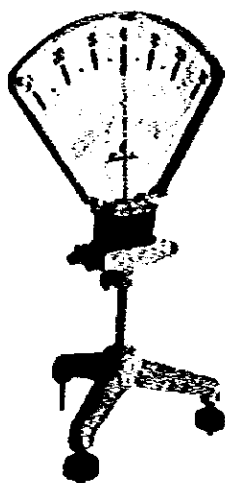
**Bearing: gem**

**A clear large scale**

**Remarks:**

**For the teacher's use**

**Convenient for practice during lecture**



**4-36 Mirror galvanometer**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Shimazdu Scientific Instrument      Demonstration Universal-meter type DU-8N	80	4	320

**Specifications:**

Used for all types of electrical experiments in classroom demonstrations.

For both AC and DC

Moving coil type

Measuring range:

AC voltmeter: 15V/150V

AC ammeter: 1A/5A

DC voltmeter: 3V/15V

DC ammeter: 500mA/5A

Accuracy: with 4%

**Remarks:**

An universal-meter used by teacher in classroom demonstrations

Handy type

Can be easily seen by students

**4-37 Mirror galvanometer**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Shimazdu Scientific Instrument Reflection galvanometer type L, A class	65	2	130

**Specifications:**

**Current sensitivity:  $1.5 \times 10^{-8}A$**

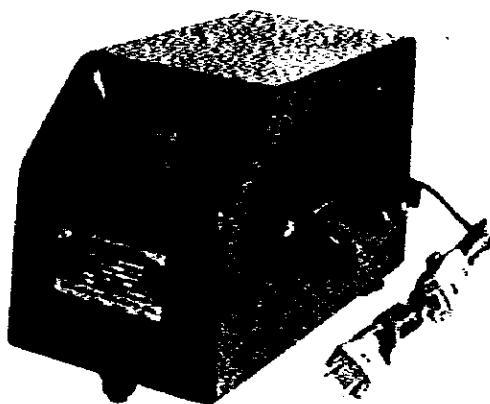
**Coil resistance: less than  $600\Omega$**

**Moving coil type galvanometer**

**Reflection galvanometer and AC lamp and scale in case**

**Remarks:**

**Simple and handy type reflection galvanometer**



4-38 LCR meter

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
	130	12	1,560

**Specifications:**

Same as No. 3-31

Small and handy type

**4-39 Wattmeter**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Yokogawa Electric Works      Portable standard wattmeter type 2041	42	32	1,344

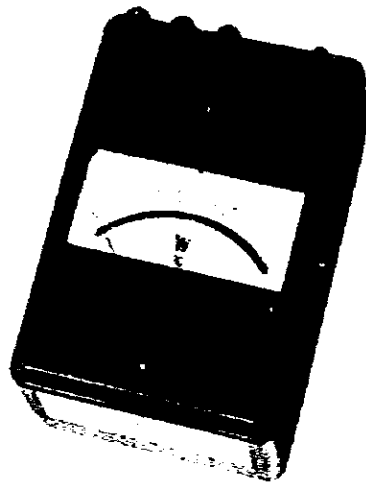
**Specifications:**

**Class: JIS C 1102    0.5 class**

**Rating: 120/240V, 5/25A**

**Remarks:**

**Single-phase, low-power-factor wattmeter**





**4-40 Integrating wathourmeter**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Fuji Electric	8	18	144

**Specifications:**

Single phase  
100V, 20A, 60 Hz

**Remarks:**

Can measure the wathour of single phase electricity.  
With caster

**4-41 Three-phase wattmeter**

Room No. & name of facilities				
Name of manufacturer & type for reference	Unit price	Q'ty	Amount	
Yokogawa Electric Works      Portable standard wattmeter type 2042	55	12	660	

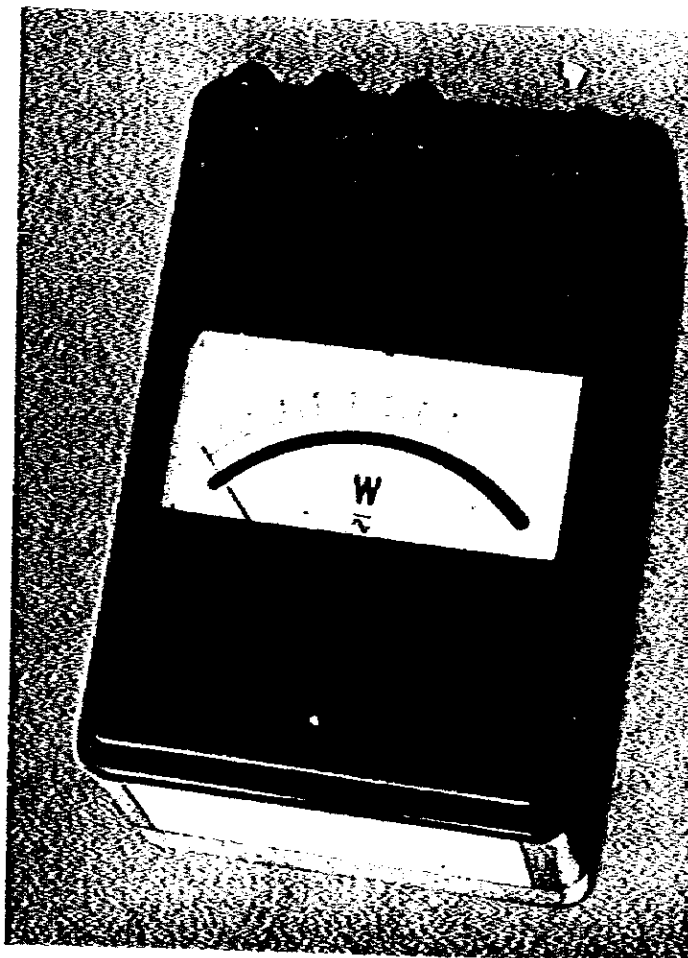
**Specifications:**

**Class: 0.5 class (Japanese Industrial Standard JIS C 1102)**

**Rating: 120/240V, 5/25A**

**Remarks:**

**Three-phase AC wattmeter for fundamental experiments**



**4-42 Three-phase integrating watt-hourmeter**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Fuji Electric	11	12	132

**Specifications:**

**Three-phase, three-wire system**

**380V, 20A**

**60 Hz**

**Remarks:**

**For measuring the watt-hour of three-phase AC electricity.**

4-43 Power factor meter

Room No. & name of facilities			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Yokogawa Electric Works      Type 2039	45	12	540

Specifications:

Rated Accuracy:  $\pm 3^\circ$  expressed as a phase angle

Scale:

Power Factor;    Lead 0-0.3-1.0-0.3-0 Lag

Phase Angle;    Lead  $90^\circ$ - $0^\circ$ - $90^\circ$  Lag

Effective Power Factor Measuring Range:

Lead 0.5-1.0-0.5 Lag

Frequency Influence: Within  $\pm 1.5^\circ$  in phase angle at 45 to 65 Hz

Accessory: Carrying Case

Range:

1/5A, 120V (Usable in the range of 60 to 300V) ..... 6 sets  
 5/25A, 120V (                      - ditto -                      ) ..... 6

Remarks:

A power factor meter for measurement of single-phase AC electricity.



**4-44 Frequency meter**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Yokogawa Electric Works    Type 2038	35	12	420

**Specifications:**

**Range:**

**Frequency: 45 - 65 Hz**

**Voltage: 120/240 V**

**Class: JIS C 1102 0.2 class**

**Accessory: carrying case**

**Remarks:**

**A frequency meter for measurement of single-phase AC electricity.**



4-45 Gauss meter

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Yokogawa Electric Works      Type 3251	340	32	10,880

**Specifications:**

Method of Measurement: Constant current drive system with germanium Hall generator probe  
 Measuring Range: 20/50/100/200/500/1,000/2,000/5,000/10,000/20,000 gauss  
 Frequency Range: DC to 500 Hz (mean value for AC)  
 Polarity Indication: N and S polarities  
 Accuracy:  $\pm 2.5\%$  of full scale at DC or 50 to 60 Hz  
 Output: Recorder Output, Approx. 10mV; Internal Resistance, Approx. 500  $\Omega$  (DC magnetic field only)  
 Oscilloscope Output, Modulated wave including 1 kHz carrier signal  
 Power Supply: 220 V AC  $\pm 10\%$ , or 60 Hz

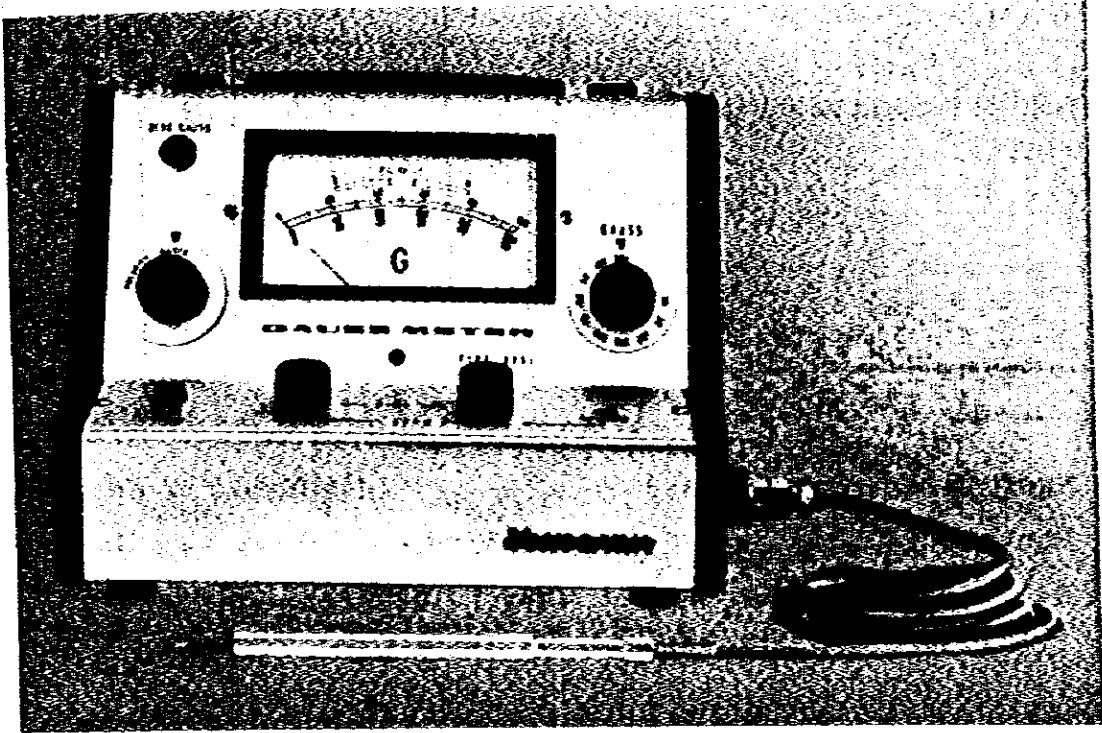
**Accessories:**

Reference magnet (1,000 gauss) ..... 1 pc. (built in)  
 External standard magnet ..... 1  
 Flat probe ..... 1  
 Axial probe ..... 1

**Remarks:**

Can measure the magnetic flux density and polarity of magnetic poles, by using a germanium Hall generator as a magnetic field detector.





**4-46 Clamp-on ammeter**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	200	12	2,400

**Specifications:**

Same as No. 3-35

**4-47 Electrostatic voltmeter**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Shimazdu Scientific Instrument      Static monitor type SM-10	220	12	2,640

**Specifications:**

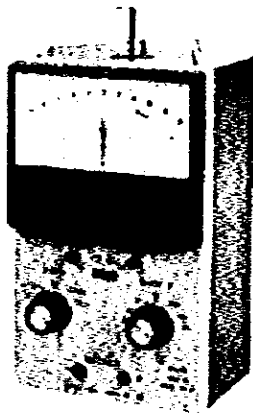
**Static electricity voltmeter**

**Range of measurement: 0 - 10 kV or higher**

**By operating a switch, both commercial electric power and batteries are used.**

**Remarks:**

**Can measure the electrification quantitatively**



4-48 - 49 DC voltage /current calibration set (DC voltmeter and DC ammeter)

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Yokogawa Electric Works DC voltage /current calibration set type 2850	750	1	750

Specifications:

(Capable of providing)

DC voltage ranging from  $1\mu$  V to 1,200 V and DC current from 0.01  $\mu$  A to 36A.

The minimum scale graduation shall be as small as possible, less than 1/1,000.

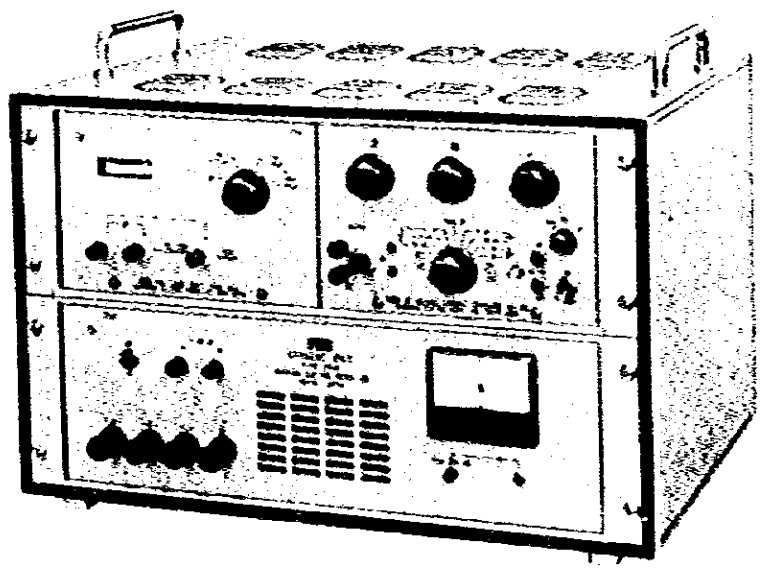
DC voltage and current are supplied at an accuracy of  $\pm 0.07$  to  $\pm 0.3\%$ .

Variation: within  $\pm 0.05\%$  against voltage variation of  $\pm 10V$

Simple dial operation

Remarks:

This instrument is suited for calibration of various DC measuring and recording instruments.



4-50 - 51 AC voltmeter and AC ammeter

Room No. & name of facilities			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Yokogawa Electric Works AC voltage/current standard type 2858	820	1	820

Specifications:

Can supply AC reference standard voltages from 1 to 1,000 V, and AC reference standard currents from 10 mA to 50A.

Accuracy: within  $\pm 0.1\%$  of rated value on voltage and current ranges

Distortion factor: less than 0.3% on voltage and current ranges

Output frequency: built-in oscillator: 40 to 500 Hz (continuously variable)

Stability: 0.02%/3 hours

In-line: digital display

Built-in protection circuit

Decimal point: automatically shiftable

Accessories:

Output cord ..... 2 pcs.

Power cord ..... 1 set

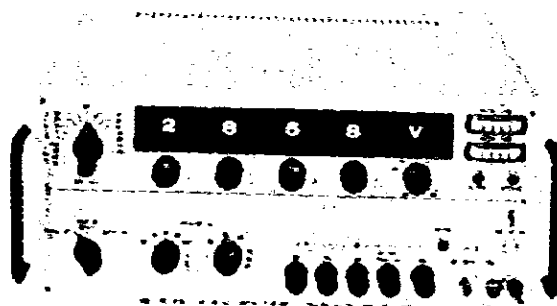
Fuses ..... 6 pcs.

Lamps ..... 3

Remarks:

Can supply precise AC standard voltages and currents with simple dial operation.

Can measure frequency range.

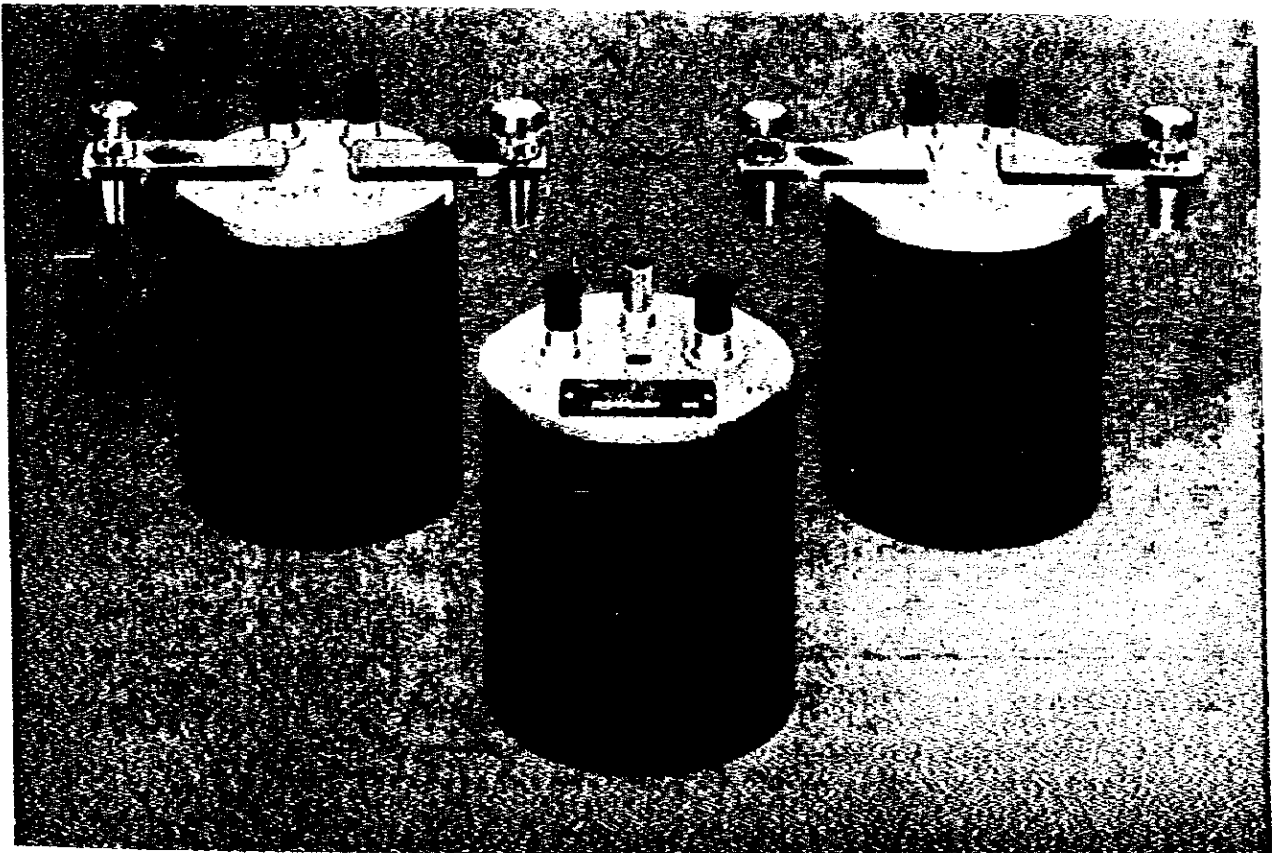


4-52 Resistor

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Yokogawa Electric Works Standard resistor type 2792	40	40	1,600

Specifications:

Nominal value:	Accuracy:	Q'ty:
0.001Ω	±0.01%	10
0.01Ω	±0.005%	10
1.0Ω	ditto	10
100Ω	ditto	10



#### 4-53 Inductance

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Ando Electric                  Standard variable inductors type B-3	65	20	1,300

**Specifications:**

**Self inductance:**

Inductance: 0.1 - 10 mH

Accuracy (at 1 kHz):  $\pm 2\%$

Mutual inductance:  $\pm 0$  to 2 mH

#### 4-54 Capacitor

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Yokogawa Electric Works                  Type CS-1000A	30	12	360

**Specifications:**

Capacity: about 1,000pF, 30pF and others.

Pressure resisting: 1,000 V

4-55 Resistor

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

Specifications:

Slide resistor

Same as No. 3-29

Nominal value:

4,800 $\Omega$ .....	20 pcs.
1,400 $\Omega$ .....	20
600 $\Omega$ .....	10
170 $\Omega$ .....	10
(Total)	60 pcs.

Allowable deviation:  $\pm 20\%$  of nominal value

Remarks:

Sturdy type for students' practice.

**4-56 Auto transformer**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	70	60	4,200

**Specifications:**

**Same as No. 3-30**



**4-57 Auto transformer**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Shimazdu Scientific Instrument      Laboratory volt box type VB-110	33	17	561

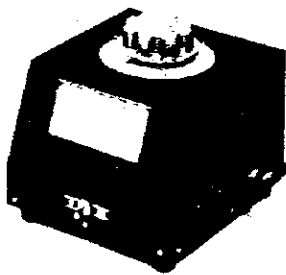
**Specifications:**

**Output voltage: 0 - 130 V**

**Safe current: 10A**

**Remarks:**

**Shall be sturdy and handy**



**4-58 Counter**

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

**Remarks:**

For measuring frequency

**4-59 Stopwatch**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Tokyo Tokei                      Type 1008	10	17	170

**Specifications:**

Scale: 60 seconds in one revolution and one minute is divided by 100.

Integrating type

Minimum graduation: less than 0.2 second and 0.01 minute

With 30-minute meter

**4-60 Oscillator**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
	35	17	595

**Specifications:**

**Low-frequency oscillator**

Range: 0 - more than 500 kHz,  
Accuracy: with  $\pm 5$  dB

Same as No. 3-39

**4-61 Special waveform generator**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Iwatsu Function generator type FG-121B	400	6	2,400

**Specifications:**

**Output waveforms: 7 waveforms including sine wave, square wave and triangle wave**

**Frequency range: 0.001 Hz - 100 kHz**

**Frequency modulation: VCF (Voltage Control Frequency) - x1000max. by external signal**

**Output**

**Amplitude: 10V<sub>p-p</sub> min. (50Ω load)**

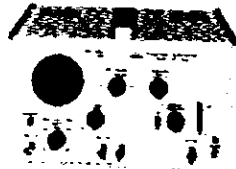
**Attenuator: 0dB, 20dB, 40dB**

**Sine-wave distortion: less than 1%**

**Power source : AC 220V ±10%, 60Hz**

**Remarks:**

**This function generator for basic practice shall be especially able to generate low frequency stably and to measure such frequency accurately.**



4-62 Oscillograph

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Yokogawa Electric Works Flatbed pen recorder type 3066	620	2	1,240

Specifications:

3-channel model oscillograph

Maximum sensitivity:  $5\mu$  V/cm

Chart speeds: 2, 6, 20, 60 cm/min and cm/h

Disposable felt-tip pen

Power source: AC 220V  $\pm$ 10%, 60 Hz

Accessories and spares:

Recording paper:

Z-fold chart ..... 10 charts

Roll chart ..... 10 rolls

Disposable felt-tip pen cartridge:

1st channel (red) ..... 9 pcs.

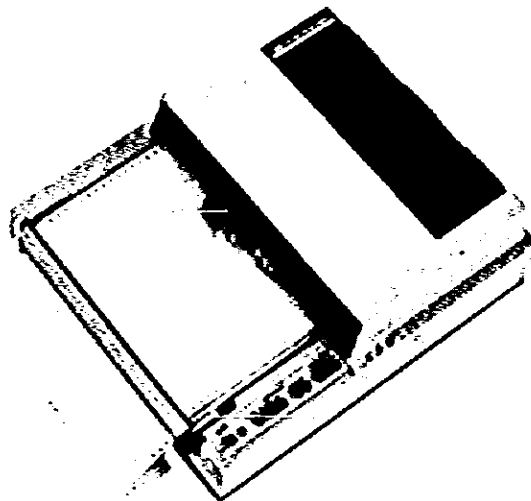
2nd channel (green) ..... 9

3rd channel (blue) ..... 9

Remarks:

Can record rool chart.

3-channel model



4-63 X-Y recorder

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Yokogawa Electric Works Type 3083	550	6	3,300

**Specifications:**

Size: A4 size

Drive system: automatic balance type (AC servo mechanism)

Maximum pen speed: 0.7 second for 200 mm

Recording mechanism: Ink writing (felt-tip pen and ball-point pen also usable)

Chart: roll chart paper or sheet (8-1/2 x 11")

Effective recording area: 250 mm (X-axis) x 180 mm (Y-axis)

Dead band: 0.15% of 250 mm (X-axis), or 180 mm (Y-axis)

Power source: AC 220V ±10%, 60 Hz

Time base unit (with DC voltage ranges)

Paper take-up unit

**Accessories and spares:**

1. Accessories

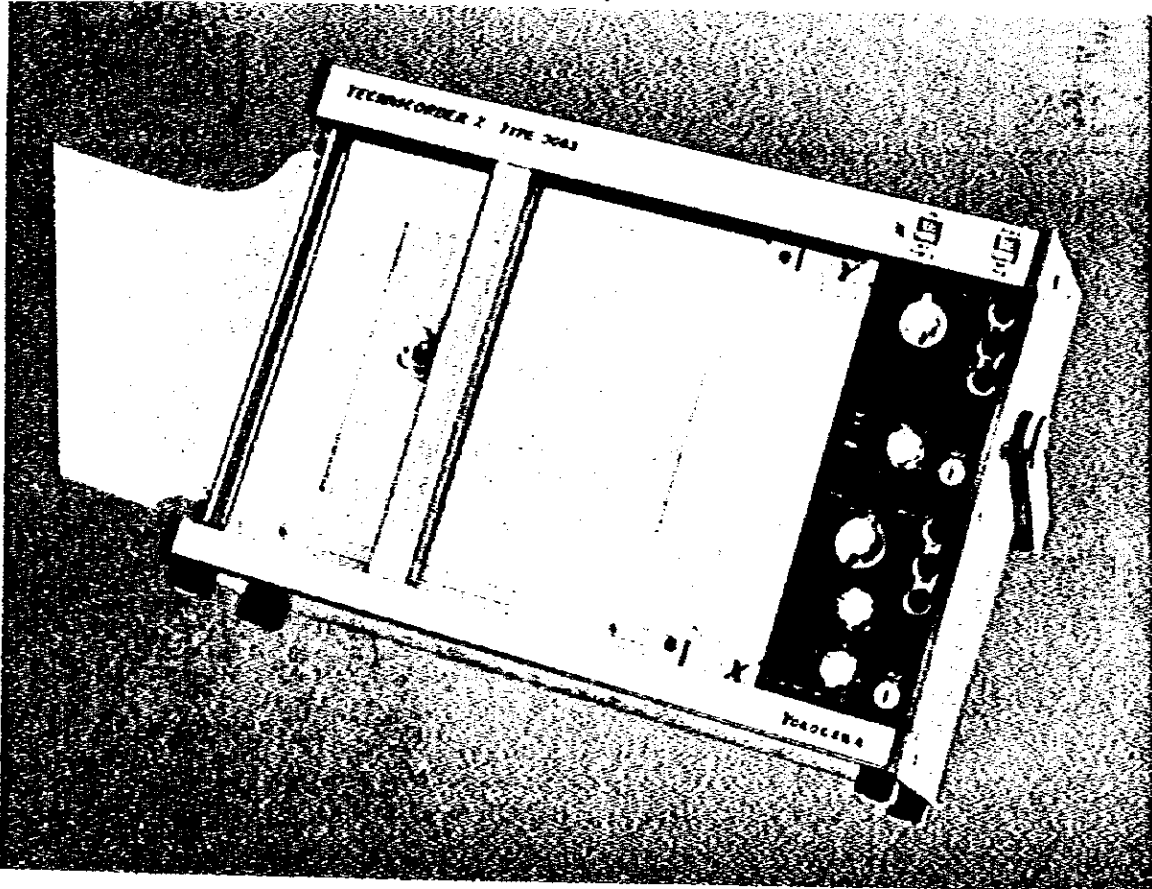
*Roll chart (210mmx15m)		2 rolls	
Ink	Quick-drying	Red	2 pcs.(30cc)
		Green	-
	Normally-drying type	Red	-
		Green	-
Writing pen unit (pen and ink reservoir)		1 pc.	
Pen holder		1 pc.	
Ink filler		2 pcs.	
Cap for ink filler		2 pcs.	
Ink filler spout		1 pc.	
Instruction card for inking		1 sheet	
Pen cleaning wire		1 set	
Dust cover		1 pc.	
Tweezers		1 pc.	
Rubber magnet		2 pcs.	
Fuses (1A)		2 pcs.	
24-pin connector plug		1 pc.	

2. Spares

3 sets of accessories.

**Remarks:**

**This instrument is packaged in a compact die-cast case and features rugged, modular construction to assure stable long-term operation.**



4-66 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



4-67 Grounding resistance meter

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Yokogawa Electric    Earth tester type 3235	36	4	144
Auxiliary earthing net type 3209	3	4	12
	(Total)		156

Specifications:

Measuring range:

Earth resistance: 0 to 10 to 100 to 1,000Ω

Earth voltage: 0 to 30 V

Accuracy:

Earth Resistance:

- ±5% of 2Ω (±0.1Ω or min. one div.) in the range of 0 to 2Ω
- ±2.5% of 20Ω (±0.5Ω or min. one div.) in the range of 2 to 20Ω
- ±2.5% of 200Ω (±5Ω or min. one div.) in the range of 20 to 200Ω
- ±5% of 1,000Ω (±50Ω or min. one div.) in the range of 200 to 1,000Ω

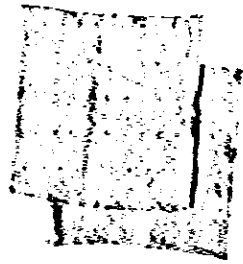
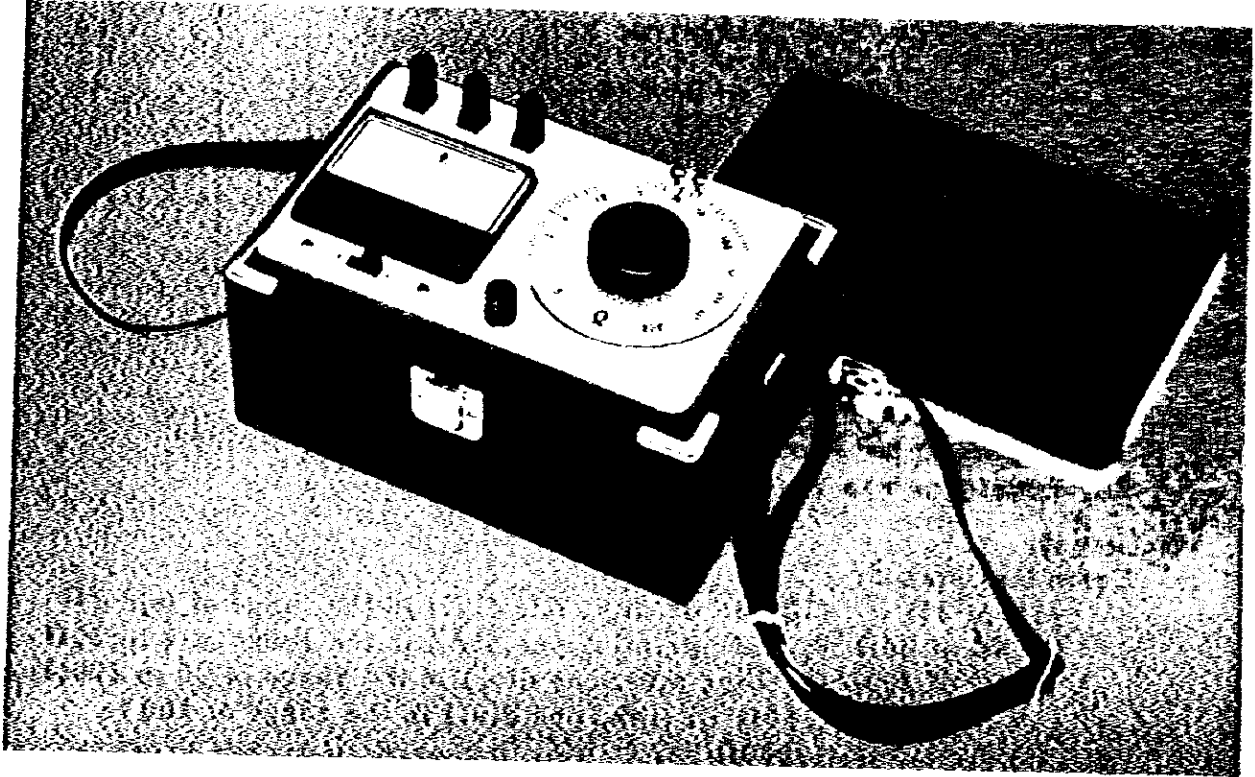
Earth Voltage: ±5% of full scale value.

Accessories:

- Auxiliary earthing net ..... 1 pc.
- Dry cells JISC 8501 type UM-1 ..... 4 pcs.
- Carrying case ..... 1 pc.
- Measurement leadwires ..... 3 pcs.
- Earth spikes ..... 2 pcs.
- Accessory storage bag ..... 1 pc.

Remarks:

This earthing resistance meter shall be of automatic type with a built-in transistor oscillator.



**4-68 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

**Remarks:**

DC stabilized power source for practice  
0 - 30V, 5A max.

4-69 Eliminator power unit

Room No. & name of facilities			
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Iwatsu                      Type AR-5000	250	5	1,250
Uchida Yoko              Type TT-M	60	5	300
	(Total)		1,550

**Specifications:**

Same as No. 3-47

High voltage DC power source shall be installed.

A power source: AC 5V & 6.3V, 1A

B power source: DC 0 - 400V, 0.1A

DC 0 - 170V, 0.2A

C power source: DC 0 - 20V, 10mA

} continuously variable

Power source: AC 220V, 60Hz

**Remarks:**

This unit is used to stabilize AC power source voltage to supply each desk with stable 115V & 100V.

4-70 Workbench

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
Work bench	-	65	2,680
Chair	5	122	610
	(total)		3,290

Specifications:

Same as No. 2-32

1,500 x 500 x 760 H .....	6 sets x 30,000 =	180,000 yen
1,500 x 750 x 760 H .....	45 sets x 40,000 =	1,800,000
Desks for teachers .....	4 sets x 50,000 =	200,000
Desks for instruments .....	10 sets x 50,000 =	500,000
Chair: Same as No. 2-32 ....	122 sets x 5,000 =	610,000

(Total)

3,290,000 yen

**4-71 Locker**

Room No. & name of facilities		-		
Name of manufacturer & type for reference		Unit price	Q'ty	Amount
Kokuyo	Locker consisting of upper and lower halves	60	30	1,800
	Rack	55	20	1,100
		(Total)		2,900

**Specifications:**

Same as No. 2-32

Locker for arrangement:

1,760W x 400D x 880H ..... 30 sets

Glass door for upper half and metallic door for lower half

Rack:

cf. No. 3-50 ..... 20 sets

**4-72 Movable blackboard**

Room No. & name of facilities		Db 103, 105, 106 Lab-1, 2, 3 EI		
Name of manufacturer & type for reference		Unit price	Q'ty	Amount
-		50	4	200

**Specifications:**

Same as No. 2-34

**4-73-1 Copier**

Room No. & name of facilities	Db 104, 107 Preparation EI		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	400	2	800

**Specifications:**

Same as No. 1-4

**4-73-2 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

4-73-3 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

4-73-4 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



**4-73-5 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

**4-73-6 Taperecorder**

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	130	2	260

**Specifications:**

Same as No. 3-57

**Accessories:**

- 1. Oil ..... 3
- 2. Cassette tape (C-60) ..... 100
- 3. Head eraser ..... 6
- 4. AC power source cord ..... 2

4-73-7 VRT 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

4-74 Wires

Room No. & name of facilities	-		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
-	4	180	900

Specifications:

Same as that of No. 3-59

**4-75 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

**4-76 Tool set**

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	160	100	16,000

**Specifications:**

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

**4-77 Tools for preparatory work**

Room No. & name of facilities	—		
Name of manufacturer & type for reference	Unit price	Q'ty	Amount
—	100	5	500

**Specifications:**

Same as that of No. 3-61