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DETAILED DESIGN REPORT

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ISLAMABAD

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CONTENTS

SPECIFICATIONS

Vol III

Section 12 STANDARD

Spec. No.	SPECIFICATIONS
12.1	DC Voltage, Current Standard
12.2	AC Meter Correcting Equipment
12.3	Secondary Standard of Frequency
12.4	High Precision Type Frequency Meter
12.5	Contact Resistance Meter
12.6	Small Current Electric Potentiometer
12.7	Power Equipment for Measuring Super High Insulation Resistance
12.8	Precision Type Double Bridge
12.9	Insulation Resistance Measuring Set
12.10	Electrolytic Condenser Tester
12.11	Universal Bridge 4260A
12.12	DC Super Imposed Inductance Bridge
12.13	Dielectric Loss Measuring Set TRS-10C
12.14	Gaus Meter
12.15	Magnetic Flux Meter
12.17	Sound Meter
12.18	Digital Multimeter
12.19	Universal Counter

S-12

Spec. No. 12.1

DC Voltage, Current Standard

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1

3. Standard: (Construction dimensions, electrical requirement and necessary mechanical requirement, etc.)
   This instrument enable to take out accurate and stable DC Voltage and current. The main performances are as follows:

Range	Measurements	Accuracy	Minimum scale	Maximum output
1.000mV 0	±1,199.999mVDC	±(0.005% or 10μV)	1μV	approximately 25mA
10V 0	±11.99999VDC	±(0.005% or 50μV)	10μV	approximately 25mA
100V 0	±119.9999VDC	±(0.005% or 500μV)	100μV	approximately 25mA
1,000V 0	±1,199.999VDC	±(0.005% or 5mV)	1mV	approximately 10mA
100μA 0	119.9999μADC	±(0.02% or 2nA)	0.1nA	approximately 20V
1,000μA 0	1,199.999μADC	±(0.01% or 10nA)	1nA	approximately 20V
10mA 0	11.9999mADC	±(0.01% or 100nA)	10nA	approximately 20V
100mA 0	119.9999mADC	±(0.01% or 1μA)	100nA	approximately 20V
1,000mA 0	1,199.999mADC	±(0.03% or 30μA)	1,000nA	approximately 10V
10A 0	11.99999ADC	±(0.10% or 1mA)	10μA	approximately 1.5V
30A 0	35.9999ADC	±(0.20% or 18mA)	100μA	approximately 1V

on condition that:

Environmental temperature	23 ± 2°C
Power source	230 V ± 10%
Warming-up time	more than 60 minutes
Relative humidity	20 – 80%

S-12

Spec. No. 12.1

Note:

1. Name plate, on which name of item, date manufactured, serial number, and name of manufacturer are described in English, is to be attached to the panel or metal casing and cover. All other descriptions on the panel are to be in English.
2. Painting color is to be of manufacturer's standard.
3. Nominated manufacturer YOKOGAWA ELECTRIC WORKS, LTD.
   Model 2550 – 03

4. Accessories and Spare Parts:

5. Materials to be submitted:
   5 copies of Operational instruction manual in English, 3 copies of the same but in Japanese, 3 copies of Test result sheet, 3 copies of the Catalogue, and 4 copies each of Invoice and Packing list (of which one copy each is to be attached to the equipment).

S-12

Spec. No. 12.2
AC Meter Correcting Equipment

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the government of Japan and the Islamic Republic of Pakistan.

2. Quantity: One (1) unit

3. Standards: (Constructional Dimensions, Electrical Requirements, Necessary Mechanical Requirements, etc.)
This item is a precision measuring device of AC and is used, by operation of dial, to pick out precisely and yet with stability AC voltage and current, and its principal features are as shown in Table 1:

Table 1

Range	Range of Generation (*)	Minimum scale
10V	1.000 10.500V	1mV
20V	2.00 21.000V	10mV
50V	5.00 52.50V	10mV
100V	10.00 105.00V	10mV
200V	20.0 210.0V	0.1V
500V	50.0 525.0V	0.1V
1,000V	100.0 1,050.0V	0.1V
100mA	10.0 105.00mA	0.01mA
200mA	20.0 210.0mA	0.1mA
500mA	50.0 525.0mA	0.1mA
1A	100.0 1,050.0mA	0.1mA
2A	0.200 2.100A	1mA
5A	0.500 5.250A	1mA
10A	1.000 10.500A	1mA
20A	2.00 21.00A	10mA
50A	5.00 52.52A	10mA

* Upper limit value of range of generation is approx. 105% of each range.

S-12

Spec. No. 12.2

Unit of Indication	Automatic Switching (mA, A, V)
Stability	0.02%/3h (at warm up for 30 minutes or more)
Frequency characteristics	40 – 500 Hz ..... Within ±0.1%
Flactuation of load	±0.1% (at full load condition)
Response time	1.5s or less at 40 – 100% of range of generation of rated value (time length used to set within 0.1% when switch is put on).

Power source: AC 230V

Notes:

1. Name plate, on which name of item, date manufactured, serial number, and name of manufacturer are described in English, is to be attached to the panel or metal casing and cover. All other descriptions on the panel are to be in English.
2. Painting color is to be of manufacturer's standard.
3. Anything but those specified in this specification are subject to the catalogue.
4. Manufacturer (Nominated): YOKOGAWA ELECTRIC WORKS, LTD. Model 1858

4. Accessories and Spare Parts:

Power source cord (2 m)	1 ea.
Cord for large current (1.5 m)	2 ea.
Fuse (4A).....	4 ea.
Small lamp (15V, 30mA).....	3 ea.
Spare connector for connecting deviation unit	1 ea.

5. Materials to be submitted:
5 copies of Operational instruction manual in English, 3 copies of the same but in Japanese, 3 copies of Test result sheet, 3 copies of the Catalogue, and 4 copies each of Invoice and Packing list (of which one copy each is to be attached to the equipment).

S-12

Spec. No. 12.3
Secondary Standard of Frequency

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the government of Japan and the Islamic Republic of Pakistan.

2. Quantity: One (1) unit

3. Standards: (Constructional Dimensions, Electrical Requirements, Necessary Mechanical Requirements, etc.)

Output frequency:	100 kHz, 1 MHz, 10 MHz, 100 MHz
Output impedance:	Approx. 600 Ω/100 kHz Approx. 500 Ω/1 MHz or more
Output voltage:	Approx. 1 V rms/100 K – 1 M, 10 MHz Approx. 200 mV rms/100 MHz
Stability:	Power source fluctuation 5×10^{-10}/AC 100 V ± 10% Load fluctuation 5×10^{-10}/load fluctuation 0 – ∞ Temperature 5×10^{-10} against 25°C ± 10°C 1×10^{-9} against 25°C ± 30°C Long term stability 5×10^{-10}/day

3.1 Construction: 250 (W) x 149 (H) x 350 mm (D)

3.2 Power source: AC 100 V ± 10%, 50 Hz/Built-in chargeable battery, acting time for 10 hours.

Notes:

1. Name plate, on which name of item, date manufactured, serial number, and

Spec. No. 12.3

name of manufacturer are described in English, is to be attached to the panel or metal casing and cover. All other descriptions on the panel are to be in English.

2. Painting color is to be of manufacturer's standard.
3. Anything but those specified in this specifications are subject to the catalogue.
4. Manufacturer (Nominated): TAKEDA RIKEN INDUSTRY CO., LTD.
   Model TR-3110

4. Accessories and Spare Parts:

5. Materials to be submitted:
   5 copies of Operational instruction manual in English, 3 copies of the same but in Japanese, 3 copies of Test result sheet, 3 copies of the Catalogue, 4 copies each of Invoice and Packing list (of which one copy each is to be attached to the equipment).

S-12

Spec. No. 12.4

High Precision Type Frequency Meter

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the government of Japan and the Islamic Republic of Pakistan.

2. Quantity: One (1) unit

3. Standards: (Constructional Dimensions, Electrical Requirements, Necessary Mechanical Requirements, etc.)

Range of frequency:	10 Hz, 250 MHz (input B) 100 MHz, 550 MHz (input A)
Input sensibility:	Input A 10 mV rms Input B 25 mV rms, 10 Hz, 100 MHz 35 mV rms, 10 Hz, 250 MHz
Input coupling method:	AC coupling
Input impedance:	50 Ω (input A), 1 MΩ (input B)
Stability of crystal:	5×10^{-7}/month Temperature stability: ±10 ppm, 0 – 40°C Fluctuation of power source voltage: ±0.1 ppm (AC 100V ± 10%)
Counting capacity:	Decimal system, 8 digits

3.1 Construction: 240 (W) x 65 (H) x 180 mm (D)

3.2 Power source: AC 230 V ±10%, 50 – 400 Hz, approx. 15 VA

Notes:

1. Name plate, on which name of item, date manufactured, serial number, and name of manufacturer are described in English, is to be attached to the panel or metal casing and cover. All other descriptions on the panel are to be in English.

Spec. No. 12.4

2. Painting color is to be of manufacturer's standard.
3. Anything but those specified in this specification are subject to the catalogue.
4. Manufacturer (Nominated): TAKEDA RIKEN INDUSTRY CO., LTD.
   Model TR-5144

4. Accessories and Spare Parts:

5. Materials to be submitted:
   5 copies of Operational instruction manual in English, 3 copies of the same but in Japanese, 3 copies of Test result sheet, 3 copies of the Catalogue, and 4 copies each of Invoice and Packing list (of which one copy each is to be attached to the equipment).

S-12

Spec. No. 12.5
Contact Resistance Meter

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the government of Japan and the Islamabad Republic of Pakistan.

2. Quantity: One (1) unit

3. Standards: (Constructional Dimensions, Electrical Requirements, Necessary Mechanical Requirements, etc.)
This item is used for measuring such low resistance as contact resistance and its features are as shown in the table below.

Classification	Features
Measuring range	1 mΩ – 100 Ω full scale
Measuring frequency	1 kHz ±10%
Measuring voltage	200 μV to deflection of full scale value

3.1 Construction:
(1) Standard size is 130 (W) x 155 (H) x 279 mm (D).
(2) Measurement can be taken by 3 kinds of probes depending on the shape of body being measured.
(3) Power source connector is to be of the three-pole applying plug type (with conversion adapter for the doublepole plug type) and length of cable is to be approx. 2.2 m long.

3.2 Electrical Requirements:
Range of fluctuation of power source voltage is to be 230 V ±10%.
Range of fluctuation of power source frequency is to be 50 – 60 Hz.

Notes:
1. Name plate, on which name of item, date manufactured, serial number, and name of manufacturer are described in English, is to be attached to the panel or metal casing and cover. All other descriptions on the panel are to be in English.

Spec. No. 12.5

2. Painting color is to be of manufacturer's standard.
3. Anything but those specified in this specification are subject to the catalogue.
4. Manufacturer (Nominated): YHP, Model 4318A

4. Accessories and Spare Parts:

5. Materials to be submitted:
   5 copies of Operational instruction manual in English, 3 copies of the same but in Japanese, 3 copies of Test result sheet, 3 copies of the Catalogue, and 4 copies each of Invoice and Packing list (of which one copy each is to be attached to the equipment).

Spec. No. 12.6

Small Current Electric Potentiometer

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the government of Japan and the Islamic Republic of Pakistan.

2. Quantity: One (1) unit

3. Standards: (Constructional Dimensions, Electrical Requirements, Necessary Mechanical Requirements, etc.)

Range of voltage measurement:	±1 mV – 30 V, 10 ranges
Voltage input impedance:	1×10^{15} Ω or more
Accuracy for voltage measurement:	±(0.5 – 3)% of f.s ± meter accuracy (±1%)
Range of current measurement:	1×10^{-5} – 3×10^{-5} A
Accuracy for measurement:	±0.5 – 10% of f.s ± meter accuracy
Input impedance:	Switching 10^{12}, 10^{10}, 10^{8}, 10^{6} Ω

3.1 Construction:

Pre-amplifier	150 (W) x 190 (H) x 142 mm (D)
Main amplifier	250 (W) x 149 (H) x 250 mm (D)

3.2 Electrical Requirements:

Output for recorder	+10 mV/10 Ω at full scale
Power source	AC 230 V ± 10%, 50/60 Hz, approx. 8 W

Notes:

1. Name plate, on which name of item, date manufactured, serial number, and name of manufacturer are described in English, is to be attached to the panel or metal casing and cover. All other descriptions on the panel are to be in English.
2. Painting color is to be of manufacturer's standard.
3. Anything but those specified in this specification are subject to the catalogue.

Spec. No. 12.6

4. Manufacturer (Nominated): TAKEDA RIKEN INDUSTRY CO., LTD.
   Model TR-84M

4. Accessories and Spare Parts:

5. Materials to be submitted:
   5 copies of Operational instruction manual in English, 3 copies of the smae but in Japanese, 3 copies of Test result sheet, 3 copies of the Catalogue, and 4 copies each of Invoice and Packing list (of which one copy each is to be attached to the equipment).

Spec. No. 12.7
Power Equipment for Measuring Super High Insulation Resistance

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the government of Japan and the Islamic Republic of Pakistan.

2. Quantity: One (1) unit

3. Standards: (Constructional Dimensions, Electrical Requirements, Necessary Mechanical Requirements, etc.)

Output voltage:	100 V, 250 V, 500 V, 1,000 V
Output current:	100 μA
Output polarity:	Floating, either one of + or – can be grounded

3.1 Construction: 250 (W) x 150 (H) x 250 mm (D)

3.2 Electrical Requirements:

Output indicator:	Class 1.5
Power source:	90 V layer-built cell (BL-160B) x 12

Notes:

1. Name plate, on which name of item, date manufactured, serial number, and name of manufacturer are described in English, is to be attached to the panel or metal casing and cover. All other descriptions on the panel are to be in English.
2. Painting color is to be of manufacturer's standard.
3. Anything but those specified in this specification are subject to the catalogue.
4. Manufacturer (Nominated): TAKEDA RIKEN INDUSTRY CO., LTD.
   Model TR-300C

4. Accessories and Spare Parts

Spec. No. 12.7

5. Materials to be submitted:
   5 copies of Operational instruction manual in English, 3 copies of the same but in Japanese, 3 copies of Test result sheet, 3 copies of the Catalogue, and 4 copies each of Invoice and Packing list (of which one copy each is to be attached to the equipment).

S-12

Spec. No. 12.8
Precision Type Double Bridge

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the government of Japan and the Islamic Republic of Pakistan.

2. Quantity: One (1) unit

3. Standards: (Constructional Dimensions, Electrical Requirements, Necessary Mechanical Requirements, etc.)
   This item is a precision type AC low resistance measurement device, capable of measuring low resistance of less than 100 Ω, and is used for precision measurement of general resistance and conductivity of conductor and is also used as corrector-tester for standard resistor. Principal feature of this item is as shown in Table 1 below:

Table 1

Classification	Specification
Measuring range	0.10000 mΩ – 111.10 Ω (Nos. of digits for read-out: 5 digits)
Measuring dial	100 mΩ x 10 + 10 mΩ x 10 + 1 mΩ x 10 + 0.05 – 105 mΩ (Minimum scale ..... 0.01 mΩ)
Magnification	x 0.001, x 0.01, x 0.1, x 1, x 10, x 100
Telerance	± (0.03% of measured value +1 μΩ) ..... at ambient temperature of 20 ±2.5°C ± (0.05% of measured value +1 μΩ) ..... at ambient temperature of 10 – 40°C
Current capacity	x 0.001 ..... 30 A x 0.01 ..... 10 A x 0.1 ..... 3 A x 1 ..... 0.5 A x 10 ..... 0.15 A

S-12

Spec. No. 12.8

Classification	Specification
	x 100 ..... 0.05 A
Insulation resistance	DC 250 V/1,000 MΩ or more between casing and circuit (at humidity of 75% or less)
Dielectric strength	AC 500 V, 1 min. between casing and circuit

Notes:

1. Name plate, on which name of item, date manufactured, serial number, and name of manufacturer are described in English, is to be attached to the panel or metal casing and cover. All other descriptions on the panel are to be in English.
2. Painting color is to be of manufacturer's standard.
3. Anything but those specified in this specification are subject to the catalogue.
4. Manufacturer (Nominated): YOKOGAWA ELECTRIC WORKS, LTD.
   Model 2752

4. Accessories and Spare Parts

   Plug 2

   Measuring cord type 2753, current cord 2 m x 2 (approx. 3 mΩ)

   Clamping device type 2754, measuring cord type 2753, voltage cord 2 m x 2 (approx. 8 mΩ)

5. Materials to be submitted:

   5 copies of Operational instruction manual in English, 3 copies of the same but in Japanese, 3 copies of Test result sheet, 3 copies of the Catalogue, and 4 copies each of Invoice and Packing list (of which one copy each is to be attached to the equipment).

S-12

Spec. No. 12.9

Insulation Resistance Measuring Set

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the government of Japan and the Islamic Republic of Pakistan.

2. Quantity: One (1) unit

3. Standards: (Constructional Dimensions, Electrical Requirements, Necessary Mechanical Requirements, etc.)

   3.1 Dimensions and weight:
   Approx. 440 x 360 x 400 mm, approx. 25 kg

   3.2 Specification:

Measuring voltage	DC 500 V
Measuring range	1 – 1 x 10^6 MΩ
Magnification	x 1, 10, 10^2, 10^3, 10^4, 10^5
Measuring accuracy	within ±10%
Power source	AC 230 V, 50/60 Hz or DC 6 V (external)

   Notes:
   1. Name plate, on which name of item, date manufactured, serial number, and name of manufacturer are described in English, is to be attached to the panel or metal casing and cover. All other descriptions on the panel are to be in English.
   2. Painting color is to be of manufacturer's standard.
   3. Anything but those specified in this specification are subject to the catalogue.
   4. Manufacturer (Nominated): ANDO ELECTRIC CO., LTD.
      Model HR-4G

4. Accessories and Spare Parts

Spec. No. 12.9

5. Materials to be submitted:
5 copies of Operational instruction manual in English, 3 copies of the same but in Japanese, 3 copies of Test result sheet, 3 copies of the Catalogue, and 4 copies each of Invoice and Packing list (of which one copy each is to be attached to the equipment).

S-12

Spec. No. 12.10
Electrolytic Condenser Tester

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the government of Japan and the Islamic Republic of Pakistan.

2. Quantity: One (1) unit

3. Standards: (Constructional Dimensions, Electrical Requirements, Necessary Mechanical Requirements, etc.)
This item is used to test the capacity, tangent of angle loss and current leakage of electrolytic condenser and its principal features are as follows:

Measuring	Frequency Capacity	120 Hz -1 – 10,000 μF (4 ranges)
Range of measurement	Tan δ Leakage current	1 – 100% 0.5 mA, 1 mA, 5 mA, 10 mA

3.1 Construction:
(1) This item is to be accommodated in a carry-on metal casing, and its size is approx. 260 (H) x 510 (W) x 250 mm (D).
(2) AC power source cord is to be fitted with double-pole applying plug (normal working voltage AC 230 V), and is approx. 2 m long.

3.2 Necessary Electrical Requirements:
Accuracy for measuring capacity is to be ±2% of full scale of each range; accuracy for measuring tangent of angle loss is to be ±5% of full scale; and the accuracy for measuring current is to be within ±2.5% of each full scale.

Notes:
1. Name plate, on which name of item, date manufactured, serial number, and name of manufacturer are described in English, is to be attached to the panel or metal casing and cover. All other descriptions on the panel are to be in English.

Spec. No. 12.10

2. Painting color is to be of manufacturer's standard.
3. Anything but those specified in this specification are subject to the catalogue.
4. Manufacturer (Nominated): ANDO ELECTRIC CO., LTD.
   Model CM-6

4. Accessories and Spare Parts:

Power source cord	1 ea.
Fuse	No. of those presently used x 2 (excepting those mounted in the equipment)

5. Materials to be submitted:
   5 copies of Operational instruction manual is English, 3 copies of the same but in Japanese, 3 copies of Test result sheet, 3 copies of the Catalogue, and 4 copies each of Invoice and Packing list (of which one copy each is to be attached to the equipment).

S-12

Spec. No. 12.11
Universal Bridge 4260A

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the government of Japan and the Islamic Republic of Pakistan.

2. Quantity: One (1) unit

3. Standards: (Constructional Dimensions, Electrical Requirements, Necessary Mechanical Requirements, etc.)
This item is used to measure AC resistance, inductance and capacitance of various parts, and its principal features are as shown in the table below:

Classification	Feature
Measuring frequency	1 kHz ± 2%
Measuring range	L: 1 μH – 1,000 H, C: 1 pF – 1,000 μF R: 10 mΩ – 10 MΩ

3.1 Construction:
(1) Standard size is 198 (W) x 166 (H) x 280 mm (D).
(2) Measurement is carried out by connecting specimen to bannana terminal on the surface.
(3) Power source connector is to be the 3-pole applying plug type (with conversion plug for the double-pole plug type and, cable is to be approx. 2.2 m long).

3.2 Electrical Requirements:
Range of fluctuation of power source voltage is to be 230 V ± 10%.
Range of fluctuation of power source frequency is 50 – 60 Hz.

Notes:
1. Name plate, on which name of item, date manufactured, serial number, and name of manufacturer are described in English, is to be attached to the panel or metal casing and cover. All other descriptions on the panel are to be in English.

Spec. No. 12.11

2. Painting color is to be of manufacturer's standard.
3. Anythings but those specified in this specification are subject to the catalogue.
4. Manufacturer (Nominated): YHP, Model 4260A

4. Materials to be submitted:
   5 copies of Operational instruction manual in English, 3 copies of the same but in Japanese, 3 copies of Test result sheet, 3 copies of the Catalogue, and 4 copies each of Invoice and Packing list (of which one copy each is to be attached to the equipment).

S-12

Spec. No. 12.12

DC Super Imposed Inductancee Bridge

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the government of Japan and the Islamic Republic of Pakistan.

2. Quantity: One (1) unit

3. Standards: (Constructional Dimensions, Electrical Requirements, Necessary Mechanical Requirements, etc.)
This item is used for measuring by direct reading the absolute value of impedance and phase angle of communication equipment and line in carrier frequency band, and its principal features are as follows:

Measuring	Frequency	200 Hz – 100 kHz
Measuring range	Impedance	10 – 10,000 Ω
	Phase angle	0 – ±90°C

3.1 Construction:
This item is to be accommodated in carry-on metal case and its dimensions are approx. 230 (H) x 440 (W) x 180 mm (D).

3.2 Necessary Electrical Requirements:
Measuring accuracy is to be as follows:

Measuring range	200 Hz – 70 kHz, at 50 – 3,000 Ω
Impedance	within ± (1% +0.2 Ω)
Phase angle	within ± (AfZ (%) +0.5°)
	A: Propotional constant (2×10^{-2})
	f: Measuring frequency (kHz)
	Z: Measuring impedance (kΩ)

The accuracy above is of the value for balancing circuit, and the one for unbalancing is to be three times as the above error.

Spec. No. 12.12

Notes:

1. Name plate, on which name of item, date manufactured, serial number, and name of manufacturer are described in English, is to be attached to the panel or metal casing and cover. All other descriptions on the panel are to be in English.
2. Painting color is to be of manufacturer's standard.
3. Anything but those specified in this specification are subject to the catalogue.
4. Manufacturer (Nominated): ANDO ELECTRIC CO., LTD.
   Model DRZ-2M

4. Accessories and Spare Parts:

   Receiver 1

5. Materials to be submitted:

   5 copies of Operational instruction manual in English, 3 copies of the same but in Japanese, 3 copies of Test result sheet, 3 copies of the Catalogue, and 4 copies each of Invoice and Packing list (of which one copy each is to be attached to the equipment).

S-12

Spec. No. 12.13

Dielectric Loss Measuring Set TRS-10C

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the government of Japan and the Islamic Republic of Pakistan.

2. Quantity: One (1) unit

3. Standards: (Constructional Dimensions, Electrical Requirements, Necessary Mechanical Requirements, etc.)
This item is used for measuring the characteristics of dielectric loss of high molecular substance (solid, liquid) that can be used for wide band, and its principal features are as follows:

Measuring	Frequency	30 Hz – 3 MHz
	Tangent δ	1×10^{-5} 1×10^{-1}, electrostatic capacity – 50 pF or more, frequency – 110 Hz or more.
Measuring range	Electrostatis capacity	1 – 200 pF
	Conductance	3×10^{-13} – 1.5×10^{-4} Ω

3.1 Construction:

(1) This item is comprised from each single unit of size shown below:

Oscillator model WBG-9
Approx. 200 (H) x 350 (W) x 300 mm (D)
Dielectric loss measuring set model TR-10C
Approx. 420 (H) x 530 (W) x 300 mm (D)
Balancing point detector model BDA-9
Approx. 200 (H) x 350 (W) x 300 mm (D)
Electrode type SE-30
Approx. 200 (H) x 160 (W) x 160 mm (D)

Accessories and spare parts are as shown in attached sheet.

Spec. No. 12.13

(2) AC power source cord is to be fitted with double-pole applying plug (normal working voltage of AC 230 V).

3.2 Necessary Electrical Requirements:

Measuring accuracy is to be as follows:

Tangent δ	within $\pm(10\% + 2 \times 10^{-5})$
Electrostatic capacity	within ±3% (at 15 pF or more)
Conductance	within $\pm(3\% + 3 \times 10^{-15}\ \Omega)$

Notes:

1. A name plate, on which name of item, date manufactured, serial number, and name of manufacturer are described in English, is to be attached to the panel or metal casing and cover. All other descriptions on the panel are to be in English.
2. Painting color is to be of manufacturer's standard.
3. Anything but those specified in this specifications are subject to the catalogue.
4. Manufacturer (Nominated): ANDO ELECTRIC CO., LTD.
   Model TR-10C

4. Materials to be submitted:

5 copies of Operational instruction manual in English, 3 copies of the same but in Japanese, 3 copies of Test result sheet, 3 copies of the Catalogue, and 4 copies each of Invoice and Packing list (of which one copy each is to be attached to the equipment).

S-12

Spec. No. 12.13

Item No.	Description	Specification	Q'ty	Unit	Remark
	Oscillator Model WBG-9	Accessories and spare parts			
	Measuring cord		2	ea.	
	Power source cord		1	ea.	
	Fuse		Nos. of those presently used x 2	ea.	(Except those mounted on the equipment.)
	Balancing Point Detector Model BDA-9	Accessories and spare parts			
	Measuring cord		1	ea.	
	Power source cord		1	ea.	
	Fuse		Nos. of those presently used x 2	ea.	(Except those mounted on the equipment.)
	Electrode Type SE-30	Accessories and spare parts			
	Ring turner		2	ea.	
	Packing		1	ea.	

S-12

Spec. No. 12.14

Gaus Meter

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the government of Japan and the Islamic Republic of Pakistan.

2. Quantity: One (1) unit

3. Standards: (Constructional Dimensions, Electrical Requirements, Necessary Mechanical Requirements, etc.)
   This item is used, by use of Hall generator of germanium in measuring element, to measuring characteristic of magnetic material, magnetic flux density of meter, leaking magnetic flux of electronic circuit, etc. Principal features of it are as shown in Table 1 below:

Table 1

Classification	Specification
Range of measurement	Magnetic flux density: 20/50/100/200/500G 1/2/5/10/20 KG Switching 10 kinds (frequency range; DC ~ 500 Hz) Polarity: indicates N and S poles
Accuracy	DC magnetic field: ±2.5% of max. dial value with 50/60 Hz, ±3% of max. dial value with others.
Scale	Even scale (50 sections) and indication of N and S poles.
Power source	AC 230 V ±10% for both 50, 60 Hz

Notes:

1. Name plate, on which name of item, date manufactured, serial number, and name of manufacturer are described in English, is to be attached to the panel or metal casing and cover. All other descriptions on the panel are to be in English.

2. Painting color is to be of manufacturer's standard.
3. Anythings but those specified in this specification are subject to the catalogue.
4. Manufacturer (Nominated): YOKOGAWA ELECTRIC WORKS, LTD.
   Model 3251

4. Accessories and Spare Parts:
   Built-in Standard Magnet 1 kg (for plane probe) and other as follows:

Item No.	Description	Specification	Q'ty	Unit	Remark
1.	Probe	Type 3252-01, plane (0.4 mm thick) 3.2(W) x 0.4(TH) x 8.5mm(L)	1	pc.	
2.	Probe	Type 3252-02, plane (0.8 mm thick) 3.2(W) x 0.8(TH) x 8.5mm(L)	1	pc.	
3.	Probe	Type 3252-03 (axial shape 5mmϕ x 105mm)	1	pc.	
4.	Standard magnet for axial shape probe	Type 3253 1 KG ± 0.5% (for correction of axial type probe)	1	pc.	

5. Materials to be submitted:
   5 copies of Operational instruction manual in English, 3 copies of the same but in Japanese, 3 copies of Test result sheet, 3 copies of the Catalogue, and 4 copies each of Invoice and Packing list (of which one copy each is to be attached to the equipment).

S-12

Spec. No. 12.15
Magnetic Flux Meter

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the government of Japan and the Islamic Republic of Pakistan.

2. Quantity: Two (2) units

3. Standards: (Constructional Dimensions, Electrical Requirements, Necessary Mechanical Requirements, etc.)
This item is a electronic flux meter that has a integration device using high gain type amplifier and is used at the sites, test rooms and laboratories for inspection of magnetic force of permanent magnet and for measuring magnetic flux of magnetic circuit. Its principal features are as shown in Table 1 below:

Table 1

Classification	Specification
Measuring range	$\pm 1 \times 10^2$ / 3×10^2 / 1×10^4 / 3×10^4 / 1×10^5 kMx. turns/F.S (Scale: ±1/3 kMx. turns)
Tolerance	±1% F.S
Input resistance	1×10^2 range: 2 kΩ, 3×10^4 range: 60 kΩ, 3×10^2 – 3×10^3 range: 6 kΩ, 1×10^5 range: 200 kΩ, 1×10^4 range: 20 kΩ
Drift (for 1 min.)	1×10^2 kMx. turns/F.S range: ±1% or less 3×10^2 – 1×10^5 kMx. turns/F.S range: ±0.5% or less
Power source	Dry battery 6P x 4 ..... approx. 250 hrs. as life-time continuous use.
Output voltage	±5 mV/F.S Output resistance: approx. 100 Ω

Spec. No. 12.15

Notes:

1. Name plate, on which name of item, date manufactured, serial number, and name of manufacturer are described in English, is to be attached to the panel or metal casing and cover. All other descriptions on the panel are to be in English.
2. Painting color is to be of manufacturer's standard.
3. Anything but those specified in this specification are subject to the catalogue.
4. Manufacturer (Nominated): YOKOGAWA ELECTRIC WORKS, LTD.
   Model 3254

4. Accessories and Spare Parts:
   As specified below:

Item No.	Description	Specification	Q'ty	Unit	Remark
		No. of windings / Area / Resistance value / External dimensions			
1.	Sensing coil No. 1	40 / 25 cm^2 / Approx. 2 Ω O.D.: 65 ϕ, I.D.: 48 ϕ, 5 thick	1		
2.	Sensing coil No. 2	100 / 6 cm^2 / Approx. 2 Ω O.D.: 40 ϕ, I.D.: 18 ϕ, 4 thick	1		
3.	Sensing coil No. 3	10 / 3 cm^2 / Approx. 2 Ω Outside: 15 x 65, Inside: 5 x 25, 1 thick	1		
4.	Carrying bag		1		

5. Materials to be submitted:
   5 copies of Operational instruction manual in English, 3 copies of the same but in Japanese, 3 copies of Test result sheet, 3 copies of the Catalogue, and 4 copies of Invoice and Packing list (of which one copy each is to be attached to the equipment).

S-12

Spec. No. 12.17
Sound Meter

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the government of Japan and Islamic Republic of Pakistan.

2. Quantity: 1

3. Standards: (Constructional Dimensions, Electrical Requirements, Necessary Mechanical Requirements, etc.)

This is a portable sound meter. The main performances are as shown below:

Range:	30 dB – 130 dB (A, B), 40 dB – 130 dB (C)
Frequency:	31.5 Hz – 12.500 Hz
Dimensions:	Approximately 340 x 106 x 76 mm
Weight:	Approximately 1.8 kg
Power source:	UM 3 x 4

Notes:

1. Name plate, on which name of item, date manufactured, serial number, and name of manufacturer are described in English, is to be attached to the panel or metal casing and cover. All other descriptions on the panel are to be in English.
2. Painting color is to be of manufacturer's standard.
3. Anything but those specified in this specification are subjected to
4. Nominated manufacturer: YOKOGAWA ELECTRIC WORKS, LTD.
Model 3603

4. Material to be submitted:
5 copies of Operational instruction manual in English, 3 copies of the same but in Japanese, 3 copies of Test result sheet, 3 copies of the Catalogue, and 4 copies each of Invoice and Packing list (of which one copy each is to be attached to the equipment).

S-12

Spec. No. 12.18
Digital Multimeter

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the government of Japan and the Islamic Republic of Pakistan.

2. Quantity: One (1) unit

3. Standards: (Constructional Dimensions, Electrical Requirements, Necessary Mechanical Requirements, etc.)

3.1 Range of Measurement:

DC voltage	±1 V – 10,000.00 V
DC current	0.1 mA – 119.999 mA
Resistance	0.1 mΩ – 100.000 MΩ
AC voltage	100 μV – 300.0 Vrms
Frequency	1 Hz – 50 MHz
Time interval	1 μS – 100 S
Period measurement	0.1 μS – 10 S

3.2 Dimensions: Approx. 434 x 149 x 370 mm

Notes:

1. Name plate, on which name of item, date manufactured, serial number, and name of manufacturer are described in English, is to be attached to the panel or metal casing and cover. All other descriptions on the panel are to be in English.
2. Painting color is to be of manufacturer's standard.
3. Manufacturer (Nominated): TAKEDA RIKEN INDUSTRY CO., LTD.
Model TR-6656

4. Material to be submitted:
5 copies of Operational instruction manual in English, 3 copies of the same but in Japanese, 3 copies of Test result sheet, 3 copies of the Catalogue, and 4 copies each of Invoice and Packing list (of which one copy each is to be attached to the equipment).

S-12

Spec. No. 12.19
Universal Counter

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1

3. Standards: (Constructional Dimensions, Electrical Requirements, Necessary Mechanical Requirements, etc.)

Range of measurement	DC 250 MHz (frequency input A)
Gate time	1 m, 10 m, 0.1 S, 1 S, 10 S
Period measurement	1 μS – 10^5 S (input B)
Time unit	0.1 μS – 1 mS
Frequency ratio	A/B 10^{-4} – 10^8
Average magnification of measurement	10^0, 10^1, 10^2, 10^3, 10^4
Counting capacity	Decimal system, 8 digits
Reference frequency output	10 MHz, voltage 2 Vp-p

3.1 Construction:

Dimensions	434 (W) x 124 (H) x 320 mm (D)

3.2 Electrical Requirements:

Input sensibility	Input A 50 mV – 5 Vrms, 5 steps Input B 100 mV – 10 Vrms, 5 steps
Pulse resolution	Width 2 mS, repeating 4 mS
Impedance	Input A 1 MΩ, 22 pF or less, Input B 1 MΩ, 22 pF or less
Trigger level	-1 V – +1 V continuous variation
Stability	1 x 10^{-7}/day

S-12

Spec. No. 12.19

Power source	AC 100/115/200/230 V ±10%, 50/60 Hz, 60 VA or less

Notes:

1. Name plate, on which name of item, date manufactured, serial number, and name of manufacturer are described in English, is to be attached to the panel or metal casing and cover. All other descriptions on the panel are to be in English.
2. Painting color is to be of manufacturer's standard.
3. Anything but those specified in this specification are subject to the catalogue.
4. Manufacturer (Nominated): TAKEDA RIKEN INDUSTRY CO., LTD. Model TR-5502

4. Materials to be submitted:
5 copies of OPerational instruction manual in English, 3 copies of the same but in Japanese, 3 copies of Test result sheet, 3 copies of the Catalogue, and 4 copies each of Invoice and Packing list (of which one copy each is to be attached to the equipment).

Section 13 SEMICONDUCTOR SECTION

Spec No.		SPECIFICATIONS
13.1		Manufacturing Facilities for Thin Film by Vacuum Deposition, Print Thick Film and Printed Circuit Board
	1)	Micro-Plotter
	2)	Reduction Camera
	3)	Ultra-Sonic Washer
	4)	Dryer
	5)	Vacuum Deposition Equipment
	6)	Mask Aligner
	7)	Spinner
	8)	Viscosity Meter
	9)	Etching Equipment
	10)	Hot Plate
	11)	Vacuum Furnace for Heat Treatment
	12)	Resistor Trimming Equipment
	13)	Soldering Bath and Soldering Iron
	14)	Infrared Furnace
	15)	Screen Printer
	16)	Cure Furnace
	17)	Contact Printer
	18)	Framer for Screen
	19)	Cutter
	20)	Drilling Equipment for Print Board
	21)	Prober
	22)	Clean Bench
	23)	Deionized Water Supplier
	24)	Compressor
	25)	Vacuum Set
	26)	Microscope for Inspection
	27)	Small Item, Chemicals, Materials as Attached Sheets

S-13

Spec. No. 13.1

Manufacturing Facilities for Thin Film by Vacuum Deposition, Print Thick Film and Printed Circuit Board

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratoreis, Islamabad to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Materials to be submitted:
   5 copies of Operational instruction manual in English, 3 copies of the same but in Japanese, 3 copies of Test result sheet, 3 copies of the Catalogue, and 4 copies each of Invoice and Packing list (of which one copy each is to be attached to the equipment).

3. Manufacturer (Nominated): TAKACHIHO SEIKI CO.

4. Contents of Facilities

1)	Micro-plotter	1 set	
o	Manufacturer and model:	MUTO KOGYO CO., PR-8-8LT	
o	External dimensions and weight:	900 x 1,150 x 955 mm, 160 kg	
o	Drawing scale and accuracy:	800 x 800 mm, ±20 μm	
o	Accessories:		
	(a) Cutting holder	MS-3	1 ea.
	(b) Tip for above	MSS-3	3 ea.
	(c) Tool holder	MS-6	1 ea.
	(d) Tip for above	MSS-4	10 ea.
	(e) Small circle compass	MR-1	1 ea.
	(f) Knife blade	MSR-1	4 ea.
	(g) Technical pen holder	MS-5	1 ea.
	(h) Pen for above	MSS-7	5 ea.
2)	Reduction Camera		
o	Manufacturer and model:	MAMIYA KOKI CO., RB-67	
o	Frame size:	$2\frac{1}{2}$ x $3\frac{1}{2}$ in. (actual effective pattern size: 56 x 68 mm), Daguerreo type dry plate of film is used.	

Spec. No. 13.1

- o Accessories (1 ea. each)
  - (a) CDS finder
  - (b) Dry plate holder
  - (c) No. 2 section mat
  - (d) Mirror-up release
  - (e) Auto intermediate ring
  - (f) Mounting base and tripod

3)	Ultra-Sonic Washer	2 units
o	Manufacturer:	YAMATO KAGAKU CO.
o	Model and specification:	
	BRANSON Model 52;	200 W, size of bath - 241 x 292 x 152 mm
	Model 32;	100 W, size of bath - 152 x 279 x 152 mm
4)	Dryer	2 units
o	Manufacturer and model:	YAMATO KAGAKU CO., Model DS-42
o	Internal dimensions and weight:	450 x 400 x 400 mm, 40 kg
o	Normal working temperature:	250°C
5)	Vacuum Deposition Equipment	1 set
o	Manufacturer and model:	NIHON SHINKU GIJUTSU CO., Model EBV-6DH
o	External dimensions and weight:	1,622 (H) x 1,265 x 800 mm, 650 kg
o	Accessories:	
	(a) Film thickness monitor:	SLORN DTM-200
	(b) Monitor plate for above	
	(c) Refrigerator and internal jig	
6)	Mask Aligner	1 unit
o	Manufacturer and model:	KYOWA RIKEN CO., Model K-402P
o	External dimensions and weight:	800 x 900 x 1,700 mm, 160 kg
o	Maximum exposing area:	150 mmϕ
o	Specification:	Light source – 500 W with NIKON zoom lens

Spec. No. 13.1

7)	Spinner	1 unit
o	Manufacturer and model:	KYOWA RIKEN CO., Model K-359SW
o	External dimensions and weight:	200 x 260 x 440 mm, 20 kg
o	Maximum rotating speed:	5,000 rpm ±0.5%
8)	Viscosity Meter	1 set
o	Manufacturer and model:	TOKYO KEIKI CO., Model Type C
o	Measuring range:	0 – 10,000 CP
9)	Etching Equipment	1 unit
o	Manufacturer and model:	YOSHIMATSU SHOKAI CO., Model B-3
o	Method of etching:	Splashing
o	Area of etching:	300 x 400 mm
o	External dimensions and weight:	500 x 550 x 630 (H) mm, 50 kg
o	Accessory:	Bohm meter
10)	Hot Plate	2 units
o	Manufacturer and model:	CREACT CO., Model HP-1000, HP-2000
o	Maximum temperature:	400°C
o	External dimensions:	450 x 250 x 75 mm
11)	Vacuum Furnace for Heat Treatment	1 unit
o	Manufacturer and model:	NAEBA DENKI CO., Model NBZ-501EF
o	Dimensions inside furnace:	50 ϕ x 900 mm
o	Temperature:	500°C, 3.6 kW (1 ϕ, 200 V, 60 Hz)
o	Ultimate pressure:	5 x 10^{-2} Torr.
12)	Resistor Trimming Equipment	1 set
o	Manufacturer and model:	TAKACHIHO SEIKI CO., Mode Model MIGHTY-D
o	Method:	Dentist's grinder is employed.
o	Accessories:	

(a) Vacuum type board retainer base
(b) Double-needle probing base with microscope
(c) Ohmmeter, Type 737

Spec. No. 13.1

13)	Soldering Bath and Soldering Iron	
o	Manufacturer and model:	NIPPON DEN-NETSU KEIKI CO., Model SS-5
o	Dimensions inside bath and weight:	200 x 300 x 60 mm, 19 kg
o	Soldering iron:	30 W, 40 W ..... Total 6 ea.
14)	Infrared Furnace	1 unit
o	Manufacturer and model:	CREACT CO., Model IRH-3
o	Internal dimensions:	600 x 1,000 x 700 mm
o	Maximum temperature:	150°C
15)	Screen Printer	1 unit
o	Manufacturer and model:	NEW LONG CO., Type 20A
o	Printing size:	200 x 200 mm
o	External dimensions and weight:	700 (W) x 1,270 (L) x 1,080 (H) mm, 250 kg
o	Applicable frame for screen:	450 x 450 mm
16)	Cure Furnace	1 unit
o	Manufacturer and model:	NAEBA DENKI CO., Model NBD-503-3F
o	Dimensions inside furnace:	50 mmϕ x 900 mm
o	Maximum temperature:	1,000°C, 6.9 kW
o	Method:	Time/temp. curve programming method with exhaust duct
o	External dimensions and weight:	700 x 1,200 x 1,100 mm, 250 kg
17)	Contact Printer	1 set
o	Manufacturer and model:	NIPPON BUNKA SEIKO CO., Model NPD-466
o	Printing size:	800 x 1,000 mm
o	Method:	Vacuum contact system
o	External dimensions and weight:	600 x 1,200 x 1,200 mm, 100 kg
o	Accessories:	
	(a) Light source for mercury lamp, No. 458	
	(b) Spare lamp for above	

Spec. No. 13.1

18)	Framer for Screen	1 unit
o	*Manufacturer and model:*	NIPPON BUNKA SEIKO CO., Model NPT-137B
o	Frame size:	450 x 450 mm
19)	Cutter	
o	Manufacturer and model:	DAIICHI SEITO CO., Model DMU-6
o	*Method:*	Hand operation
o	External dimensions and weight:	450 x 500 x 427 mm, 45 kg
20)	*Drilling Equipment for Print Board*	1 set
o	Manufacturer and model:	FUJI DENDO KOGU CO., Model FBV-6
o	Revolution:	12,000 rpm
o	*Area of working surface:*	160 x 160 mm
o	Diameter of drill used:	0.4 – 3 mmϕ
o	External dimensions and weight:	250 x 200 x 485 mm, 14 kg
o	*Accessories:*	
	(a) Microscope for alignment	
	(b) A set of spare drill	
21)	Prober	1 set
o	Manufacturer and model:	AOI SANSHO CO., Model JEL2000S
o	*Specification:*	*Maximum measurement of 20 pins*
o	Accessories:	
	(a) Microscope with lamp power supply	
	(b) *Vacuum pump for setting a substrate*	
22)	Clean Bench	2 units
o	*Manufacturer:*	HITACHI SEISAKUSHO CO.
o	Model:	PCH-1301-AN (Horizontal flow) PCV-1301-AF (Vertical flow with sink and duct)
o	External dimensions and weight:	1,300 (W) x 990 x 1,710 (H) mm, 150 kg

S-13

Spec. No. 13.1

23)	Deionized Water Supplier	1 set
o	Manufactured and model:	YAMATO KAGAKU CO., Model DA-125
o	Flow rate:	130 – 350 ℓ/h
o	External dimensions and weight:	170mmϕ x 1,120mm, 380mm x 900mm
o	Accessory:	Filter with 0.45 μm hole
24)	Compressor	1 unit
o	Manufacturer and model:	HITACHI SEISAKUSHO CO., Model SP-5S4-F
o	Pressure and capacity:	5 kg/cm^2, 16 ℓ
o	External dimensions and weight:	530 x 248 x 584 mm, 26 kg
o	Accessory:	Filter for demoisture
25)	Vacuum Set	1 unit
o	Manufacturer and model:	NIPPON SHINKU KOKI CO., Model G-20D
o	Evacuation capability:	20 ℓ/min.
26)	Microscope for Inspection	2 units
o	Manufacturer:	OLYMPUS KOGAKU CO.
o	Model:	
	(a) Actual immage twin lens, SZ-2	
	(b) Metal microscope, BHM-311	
	(c) Versatile mounting base, VS-5	
27)	Small Item, Chemicals, Materials	
	As attached sheets.	

S-13

Spec. No. 13.1

Item No.	Description	Specification	Q'ty	Unit	Remarks
1.	Strip coat	1,000mm x 20m, t = 125 μm	1	Roll	
		400mm x 500mm, t = 125 μm	1	Box	(cont' in 100 sheets)
2.	Micro trace	900mm x 20m, t = 125 μm	1	Roll	
3.	Lettering set ink	Tape, lettering for PCB, ink	1	Set	
4.	Photo sensitive material	Dry plate; $3\frac{1}{2}$ x $2\frac{1}{2}$ inch	2	Box	(cont' in 30 pcs.)
		Film; $3\frac{1}{2}$ x $2\frac{1}{2}$	1	Box	(cont' in 100 ex.)
5.	Chemicals for photo	Developer	36	ℓ	
		Fixer	10	ℓ	
6.	Solvent	Trichlene (500 g bottle)	30	pcs.	
	(EL grade)	Aceton (500 g bottle)	50	pcs.	
		Xylene (500 g bottle)	50	pcs.	
		Isopropyl alcohol (500 g bottle)	50	pcs.	
		Ethyl alcohol (500 g bottle)	20	pcs.	
		Linsing liquid (1 liter)	10	pcs.	
7.	Chemicals	Nitric acid (500 g bottle)	20	pcs.	
	(EL grade)	Hydrochloric acid (500 g bottle)	70	pcs.	
		Sodium hydroxide (500 g bottle)	10	pcs.	
		Sulphuric acid (500 g bottle)	50	pcs.	
		Ceric ammonium nitrate (100 g)	2	pcs.	
		Potassium iodide (100 g)	2	pcs.	
		Ferric chloride (500 g)	10	pcs.	
8.	Evaporation boat	Made of boron nitride	2	pcs.	
		Made of tungsten	50	pcs.	
9.	Evaporation source	Ni-Cr (500 g)	10	pcs.	
		Ni (500 g)	5	pcs.	
		Cu (500 g)	2	pcs.	
		Ag (25 g)	5	pcs.	
		Au (25 g)	2	pcs.	
		Al (500 g)	10	pcs.	
10.	Solder	Solder containing silver (No. 860)	10	kg	
		Solder paste (No. 322)	2	kg	

S-13

Spec. No. 13.1

Item No.	Description	Specification	Q'ty	Unit	Remark
11.	Flux for solder	Pre-flux B-111B (1 kg)	2	pcs.	
		Thinner for above (#4900) (1 kg)	1	pc.	
		Post-flux Y-20-SE (1 kg)	2	pcs.	
		Thinner for above (#4800) (1 kg)	1	pc.	
		Flux for electrode LG-60 (1 kg)	2	pcs.	
		Flux for electrode L-35 (1 kg)	1	pc.	
12.	Photo resist	For screen (Nylon resist UB-20)	2	kg	
		For thin film (OMR-83) (1 quart bottle)	5	quart	
		Stripper (OMR stripper 502)	2	gallon	
13.	Sealing resin	Powder	10	kg	
		Liquid	2	kg	
14.	Resist ink	Etch resist ER-401B	2	kg	
		Solder resist SR-31G-30	2	kg	
15.	Paste for conductor	Algelite L-1091R	200	gr.	
16.	Paste for resistor	Algelite #4025R	50	gr.	
		#4035R	100	gr.	
		#4031R	100	gr.	
		#4041R	100	gr.	
17.	Cloth for screen		30	pcs.	
18.	Frame for screen	450 x 450 mm	10	pcs.	
19.	Alumina substrate	Glazed alumina	200	pcs.	
		Alumina	500	pcs.	
20.	Print board	Paper epoxy 1 m square	20	pcs.	
		Glass epoxy	10	pcs.	
21.	Transistors	Small signal Tr., power Tr., diode, capacitor	1	set	
22.	Tool and fitting (1)	Board AA20-01	10	ea.	
		Board PA20-01	5	ea.	
		Handle A05 for above	5	ea.	
		Box PE09 for above	3	ea.	

S-13

Spec. No. 13.1

Item No.	Description	Specification	Q'ty	Unit	Remarks
		Plastic twizzers C-12	5	ea.	
		SUS twizzers	20	ea.	
23.	Tool and fitting (2)	Glass beaker (500 cc)	5	ea.	
		Glass beaker (1 ℓ)	10	ea.	
		Glass beaker (2 ℓ)	10	ea.	
		Thermometer (200°C)	5	ea.	
		Twizzers for photo	3	ea.	
		Tray for photo	5	ea.	
		Polyethylene beaker (1 ℓ)	10	ea.	
		Polyethylene beaker (2 ℓ)	5	ea.	
		Cylinder (200 cc)	2	ea.	
		Cylinder (500 cc)	2	ea.	
		Nylon scrabbing brush	10	ea.	
		Cleanser	2	ea.	
		Filter paper 15 cm	10	box	(cont' in 100 sheets)

S-13

REPORT ON FACILITIES AND SYSTEM DESIGN FOR HYBRID ICs

1. Vacuum Deposited Thin Film Hybrid IC
2. Thick Film Hybrid IC by Screen Printing
3. Printed Circuit Board

Table of Contents

S-13

PLANNING POLICY

Many approaches were considered in the study of integration of electronic circuits and the planning of facilities required for the same. It has been found that there are many common techniques and equipment in use, although some differences in degree do exist among them. Therefore, systems and equipment have been chosen so that they will be able to be adapted to the maximum extent possible for the test production of Semiconductor Monolithic Integrated Circuits, which is the ultimate objective of the integration of electronic circuits, and can be assumed to be taking place in the near future.

Consideration has been extended so as to employ, to the maximum extent, common techniques for the following three items: (1) Hybrid Integrated Circuit with Vacuum Deposited Thin Film Resistor (It is called here 'Thin Film IC'), (2) Thick Film Hybrid IC by the screen printing, and (3) Printed Circuit Board.

In order to construct the system called for by the proposed project, a minimum of ¥100,000,000 – ¥200,000,000 is usually required. However, the budget has been cut to less than half of the aforementioned amount by employing equipment which can be used in several different processes as well as using equipment used in other industries.

The minimum of necessary materials and parts have been included. Further more consideration has been given to developing small size discrete resistors which can be made by the thick film method.

PROCESS FLOW CHART

Common Processes

(1) Circuit design and art work

(2) Photo fabrication

Thin Film

* Ceramic substrate

(3) Substrate cleaning

(4) Vacuum deposition

(5) Photo resist process

(6) Chemical etching

(7) Photo resist stripping

(8) Annealing

(9) Trimming of resistor

(10) Assembly

(11) Packaging

(12) Function test and visual inspection

Thick Film

* Ceramic substrate

(3) Substrate cleaning

* Screen mask

(15) Fabrication of screen mask

(16) Framing

(13) Screen printing

(14) Curing

(9) Trimming of resistor

(10) Assembly

(11) Packaging

(12) Function test and visual inspection

Printed Circuit Board

* Copper clad laminated plate

(17) Cutting

(18) Forming

* Screen mask

(15) Fabrication of screen mask

(16) Framing

(19) Etch resist screen printing

(20) Chemical etching

(21) Drilling

(22) Solder resist screen printing

(23) Flux coating or solder plating

(10') Assembly

(12') Function test and visual inspection

S-13

EQUIPMENT PLAN BY PROCESS

I. From Design to Production of Photo Master Mask

The production processes for drawing master mask and working film or glass plate are the same for all methods.

(1) From Circuit Design to Art Work Production:
A drawing of x1 – x10 scale is made, when designing with the use of discrete components for resister, transistor, etc. The micro plotter described later is used as drawing table and table for checking the drawing. Reduction and copy of Art Work is performed as follows:

1) attach the drawing to the micro plotter lapping with the polyester masking film,
2) make cuts on the surface of the red colored layer of masking film with a diamond or super steel knife while looking at the read-out of the X-Y coordiantes, and
3) peel off the red colored layer of the required parts.

Equipment and Materials Used:

- Micro plotter (Model PR-8-8LT and accessories as manufactured by MUTO KOGYO CO.)
- Masking tape (Strip coat; manufactured by KIMOTO CO.)

(2) Photo Fabrication:
A master mask of the photo is reduced to x1 – x1/20 scale on photo sensitive film or high resolution plate from art work that made by the preceeding process, with a reduction camera.
This camera is used to take reduced photos on a film or dry plate of $2\frac{1}{2}$" x $3\frac{1}{2}$" size. The light table of micro plotter is used as picture holder and the camera is set on a tripod.
Copy numbers of working masks from the master mask. Contact printing of film is done by the use of printed circuits board exposure equipment described later, the mask aligner will be used when dry plate is used. The light source for each individual equipment is used as the light source for printing, and the development of film is done manually with the use of a tray.

S-13

Equipment and Materials Used:

- o Reduction camera (Model PB-67 and accessories as manufactured by MAMIYA KOKI CO.)
- o Contact printer (Model NPD-466, NIPPON BUNKA SEIKO CO.)
  To be common with other processes.
- o Mask aligner (Model K-402P by KYOWA RIKEN CO.)
- o Materials for photo and tool (DAINICHI SHOJI CO., ROKUO SHOJI, FUJI FILM CO., etc.)

II. Process for Vacuum Deposited Thin Film Hybrid IC

For this process, the circuits with resisters and conductors are formed by chemical etching. Each photo resist masking pattern upper deposited metal thin film, that will be made nichrome resister and conductor, by vacuum deposition over glazed alumina ceramic substrate. Thereafter, the functional block of circuit is made by soldering transistors, ICs, diodes or capacitors, etc. and the work is completed upon covering the surface with epoxy resin protective coat after mounting outer leads.

(3) Substrate Cleaning:

The alumina ceramics (thickness 0.5 – 1.0 mm, purity approx. 98%) should be cleaned and dried for screen printing or glazed alumina ceramics for vacuum deposition to be used in the next process.

In order to obtain good adhesion of the layer, dust and contamination should be removed. Cleaning should be done by an ultrasonic cleaner in a clean bench to which air is supplied through 0.4 μ of absolute filter.

After cleaning, drying should be done in a dryer at temperature of approx. 150°C.

Trichloroethylene, aceton, ethyl alcohol and deionized water are used for cleaning.

Equipment and Materials Used:

- o Ultrasonic cleaner (BRANSON Model 52, 32 by YAMATO KAGAKU CO.)
- o Dryer (Model DS-42 by YAMATO KAGAKU CO.)
- o Clean bench with sink (Model PCH-1301-AF by HITACHI SEISAKUSHO CO.)
  For common use with others.
- o Deionized water supplier (Model DA-125 by YAMATO KAGAKU CO.)
  For common use with others.
- o Solvents for above

- o Tools and fittings
- o Glazed ceramic substrates

(4) Vacuum Deposition:

Materials for resistors and conductors such as Au, Ni-Cr, Al, Ni, Cu etc. are deposited on the substrate by heating in vacuum deposition equipment. Resistor and conductor patterns are generated by processes (5), (6) and (7).

A liquid nitrogen cold trap is normally used to prevent diffused oil originating in the diffusion pump from entering the vacuum deposition chamber. Here a refrigerator has been installed instead of the usual liquid nitrogen cold trap because of the difficulty in acquiring liquid nitrogen.

A thickness monitor, manufactured by SLORN Corporation, has been installed so that the thickness of film can be measured during vacuum deposition.

A high current transformer has been provided so that boron nitride as well as tungsten can be used as the boat for vacuum deposition.

Equipment and Materials Used:

- o Vacuum deposition equipment (Model EBV-6DH with refrigerator by NIHON SHINKU GIJUTSU CO.)
- o W, BN boat for vacuum deposition (NIHON SHINKU GIJUTSU CO., TOKYO DENKI KAGAKU CO.)
- o Ni, Ni-Cr, Cu, Al, Ag, Au materials for vacuum deposition (TANAKA DENSHI CO.)

(5) Photo Resist Process:

This process is performed in combination with processes (4), (6) and (7). Process (15) involves similar process the details of which are as follows:

COATING – PRE-BAKE – EXPOSURE – DEVELOPMENT – POST-BAKE

A thin photo resist coat is manually performed by the spinner or dipping method on alumina ceramic over which a metal film has been vacuum deposited. It is then pre-baked at temperature of approx. 50°C. Thereafter, printing is done on the photo resist by exposing the film through the photo mask. A mask aligner having a Mercury lamp light source is used for this process.

When development is carried the photo resist that has not been exposed is eliminated and the metal film is exposed. By post-baking at about 120°C a resist become hard. Then, the required metal pattern is obtained by chemical etching. Alumina ceramic with resister and conductor attached is obtained through a combination of these

processes and the photo resist stripping process (6).
Photo resists should be stored in cool dark places and viscosity should be controlled by a viscosity meter.

Equipment and Materials Used:

- o Spinner (Model K-359SW by KYOWA RIKEN CO.)
- o Dryer (Model DS-42 by YAMATO KAGAKU CO.)
- o Mask aligner (Model K-402P by KYOWA RIKEN CO.)
- o Beaker for development, tray, tools and fittings (DAINICHI SHOJI CO. and others)
- o Clean bench (Model PCH-1301-AN, PCV-1301-AF by HITACHI SEISAKUSHO CO. – Common use with other process.)
- o Viscosity meter (Model Type C by TOKYO KEIKI CO.)
- o Cool storage box ..... Common use with others.
- o Photo resist, developer, linsing liquid, thinner (TOKYO OKA CO.)
- o Solvents (Iso-propyl alcohl, xylene, aceton, etc.) (KANTO KAGAKU CO.)

(6) Chemical Etching:

The required pattern is made by etching the area where the metal is not covered by the photo resist that has been formed in the photo resist process (5). This may be done by dipping it in etchant but the etching equipment is used for purpose required more accuracy.
As for the etchant, nitric acid, hydrochloric acid, ceric ammonium nitrate, potassium iodide, etc. are used in accordance with the kinds of metals.

Equipment and Materials Used:

- o Etching equipment (Model B-3 by YOSHIMATSU SHOKAI CO.)
- o Tools and Fittings, Beakers (DAINICHI SHOJI CO. and others)
- o Chemicals for etching (KANTO KAGAKU CO.)
- o Ultrasonic cleaner (BRANSON Model 52, 32 by YAMATO KAGAKU CO.)
- o Clean bench ..... Common use with other processes
- o Deionized water supplier (Model DA-125 by YAMATO KAGAKU CO.)

(7) Photo Resist Stripping:

Remaining photo resists are stripped off by the resist stripper after etching has been completed. Then, cleaning with deionized water and drying should be done. All work is to be done manually.

Equipment and Material Used:

- o Tools and fittings, beakers (DAINICHI SHOJI CO. and others)
- o Hot plate ..... Common use with other processes.
- o Ultrasonic cleaner ..... Common use with other processes.
- o Draft chamber ..... Common use with other processes.
- o Dryer ..... Common use with other processes.
- o Sulferic acid ..... Common use with other processes.
- o Resist stripper (KODAK, TOKYO OKA CO.)

(8) Annealing:

Annealing at approx. 300°C is required to correct the strain occurred during the vacuum deposition stabilizing the resistivity value. Inert gases such as Ar, etc. are normally used for carrier gas as atmosphere.

In consideration of the difficulty of acquiring these materials, a vacuum furnace has been furnished, instead.

Equipment and Material Used:

- o Vacuum furnace (Model NBZ-501EF by NAEBA DENKI K.K.)
- o Boat

(9) Resistor Trimming:

Depending on the accuracy of the photo resist, accuracies of low as 5% can be obtained for resistors formed by vacuum deposition. And depending on the screen and etc. employed, similar results are obtainable for printing. Production is therefore, usually carried out for a value less than the objective value. Afterwards correction is made by removing a part.

The scrubbing, using a dentist's compact grinder has been employed. Adjustment is carried out by measuring resistance with an ohmmeter.

Equipment and Material Used:

- o Resistor trimming equipment (Model MIGHTY-D by TAKACHIHO SEIKI CO.)

(10) Assembly:

The circuit is formed by mounting discrete transistors, IC's diodes, or capacitors on a substrate on which resistors and conductors have been formed. Soldering is used to mount components on the substrate.

Equipment and Material Used:

- o Soldering bath and soldering iron
- o Solder (6–4 solder, solder with 2 – 3% of Ag, soldering paste)
- o Flux for soldering, linsing liquid (ethyl alcohol, etc.)
- o Small signal transistors, diodes, standard ICs and capacitors
- o Tin plated wire (0.8 ϕmm) for outer lead

(11) Packaging:

All parts have been mounted and determination for passing test by measuring basic characteristics is given. But, as this test does not guarantee the reliability of the circuit against outer atmosphere, a surface passivation with epoxy resin is necessary. Substrate is heated in infrared furnace and covered with powder epoxy resin. Then it is cured by being heated again.

Equipment and Material Used:

- o Infrared furnace (Model IRH-3 by CREACT CO.)
- o Powder epoxy resin (NITTO DENKO CO.)
- o Tools and fittings, holder, etc.
- o Thinner

(12) Function Test and Visual Inspection:

A final test of the products should carried at this point, even though test was carried out before the proceeding packaging process.

IC testers in the Testing Lab Section (Spec. No. 18-1-6, 18-1-7) are used for this purpose. The testers are capable of functional tests of a bipolar IC or a CMOS IC with up to 16 pins. A prober has also been furnished.

Equipment and Material Used:

- o IC testers (Model SM 0005C and SM 0002 by KOKUYO DENKI CO.)
- o Prober (Model JEL 2000S by AOI SANSHO CO.)
- o Microscope for inspection (Model SZ-2, BHM-311 by OLYMPUS KOGAKU CO.)

III. Process for Thick Film Hybrid IC by Screen Printing

In this process, a circuit with passive elements, similar to those formed by Process (I) formed by curing following the printing of resistor and conductor layers, on alumina ceramic sub-

strates, using a screen printing technique. The circuit is completed by mounting transistors, diodes, etc. on the substrate. In this process, the production of screen frame is required for the fabrication of thick films.

(13) Screen Printing:

Resistors, etc. are printed on a clean alumina ceramic substrate after placing the substrate on the printer and then positioning the prepared pattern screen as the mask. The screen mask is made from a fine mesh of silk or stainless steel cloth on which the photoresist pattern is made by a photo fabrication process.
This prepared mask is applied to a frame, set on the alumina ceramic substrate and resistor paste is applied by squeegeeing with a spatula.
The paste is then printed on the substrate through the mask mesh.
Curing takes place after completion of the respective printing and drying processes for resistor pastes of various sheet resistances, and conductor paste.
It is not good for the pastes to be stored for a long time since they are mixtures of fine powders and vehicles. Therefore, the paste must be stored in a refrigerator and be stirred well to ensure good mixing before they are used.

Equipment and Material Used:

- o Screen printer (Model 20A by NEW LONG CO.)
- o Pastes for resistors and conductor (TAMURA KAKEN CO.)
- o Thinners (TAMURA KAKEN CO., etc.)

(14) Curing:

The printed pastes are stabilized by means of curing. The curing process is most important because it determines various resistance characteristics while the printing process determines the thickness of the film.
Curing is normally carried out in a curing furnace at a temperature increase/decrease rate of 20 – 80°C/hr., curing temperature of 750 – 850°C, and dwell time of approx. 10 – 60 minutes. The conditions are varied depending on the nature of the resistor. The control of time and temperature is conducted by a predetermined program.

Equipment and Material Used:

- o Curing furnace (Model NBD-503-3F by NAEBA DENKI CO.)
- o Draft (common use with others)
- o Thinners

(9) – (12)

These processes are similar to the ones for the production of thin films. Solder containing silver is used since the thick film printing conductor is of the Ag family, while with solder of the Pb-Sn family, a break down occurs when melting Ag into solder.

(15) Fabrication of Screen Mask:

The pattern of the photo resist film is made on the mesh cloth described in (13) in almost the same manner as that described in Process (5). The photoresist governs the thickness of printed films and the desired thickness is obtained by applying several coats. The photoresist also varies with respect to composition.

The contact printer used in Photo Fabrication Process (2) is used, as the area of exposure will be larger than that of the alumina substrate. In addition, a developing tray is used and a spray gun is employed to blow off foreign matter and prevent the screen mesh from becoming clogged.

An infrared furnace is used for drying.

Equipment and Marerial Used:

- o Infrared furnace (Model IRH-3 by CREACT CO.)
- o Silk cloth
- o Photo resist and developer, rinsing liquid
- o High-pressure spray gun
- o Hanger, tools, fittings and developing tray

(16) Framing:

The cloth on which the pattern has been completed is applied to an exclusive printer frame in the same way embroidery cloth is applied to an embroidery frame. Adequate tension is maintained and the cloth is placed a few μm above the alumina substrate and then printing is carried out by squeegeeing paste from above with a spatula.

Equipment and Material Used:

- o Framer for screen (Model NPT-137B by NIPPON BUNKA SEIKO CO.)
- o Thinner, fixer, etc.

S-13

IV. Process for Printed Circuit Board

The printed board is made by cutting a laminated plate with 35 μm copper foil on both or one surface to the required size, and on the front surface of which the conductor pattern mask is formed by means of photo resist of screen printing. After the excess copper foil has been chemically removed, 0.8 mmϕ holes are drilled where parts will be mounted.
The printing method has been employed for masking, but the photo resist method is also possible with the equipment furnished.

(17) Cutting:

Copper clad laminated plate is normally made by bonding 35 μ copper foil to an approx. 1 mm thick subbase of glass epoxy, or paper epoxy, or paper phenor, etc. by means of thermo compression bonding, and is furnished at a set size of 1 m square.
Manual plate cutting with a rotary cutter has been employed, and the equipment furnished for the purpose can also be used for alumina ceramic substrate cutting.

Equipment and Material Used:

- o Copper clad laminated plate (MATSUSHITA DENKO CO., etc.)
- o Cutter (Model DMU-6 by DAIICHI SEITO CO.)

(18) Forming:

Before making the photoresist etching mask, it is required to make the surface rough to ensure better adhesion by removing any oxide film on the copper foil surface. For this purpose, manual scrubbing with a nylon scrub brush and cleanser has been employed.

Equipment and Material Used:

- o Nylon or metal scrub brush
- o Cleanser, solvent
- o Infrared furnace ..... common for other applications

(19) Etch Resist Screen Printing:

To form conductor patterns on the copper foil layer, thick film resist paste has been employed.

Equipment and Material Used:

- o Screen printer (Model 20A by NEW LONG CO.)

- o Infrared furnace ..... common for other applications
- o Etch resist paste (Model ER-401C by TAMURA SEISAKUSHO CO.)
- o Resist remover (1 – 3% NaOH) (KANTO KAGAKU CO.)
- o Thinners

(20) Chemical Etching:

The excess copper layer is removed by chemical etching after forming a etch resist pattern film of approx. 20 μm, mentioned in (19), as a protective film against the etchant. Then, the basic conductor pattern is obtained by cleaning with water and drying the board following the removal of the etch resist with a solution of 1 – 3% NaOH.

Etching can be done manually using a tray or a spring up type etching equipment can be used.

Equipment and Material Used:

- o Etching equipment (Model B-3 YOSHIMATSU CO.) ..... common for other operations
- o Etchant (35 – 40 bohm ferric chloride solution) (KANTO KAGAKU CO.)
- o Stripper (1 – 3% of sodium hydroxide solution) (KANTO KAGAKU CO.)
- o Infrared furnace ..... common for other operations
- o Clean bench with sink ..... common for other operations

(21) Drilling:

Approx. 0.8 mmϕ holes are drilled at the locations where such parts as resistors, transistors, etc. will be inserted.

The leads of these parts are inserted through the holes and soldered.

Drilling is performed manually with drilling equipment.

Equipment and Material Used:

- o Drilling equipment for print board (Model FBV-6 by FUJI DENDO KOGU CO.)
- o Drills for above

(22) Solder Resist Screen Printing:

This process is not necessarily required. This process is, however, performed to enhance the appearance of the finished product and to reduce the occurrence rate of short circuits due to inaccurate soldering by preventing the application of solder to any places other than those required for mounting the parts.

S-13

This process is conducted the same as those for the printed resistors and printing etch resist.

Equipment and Material Used:

- o Screen printer ..... common for other operations
- o Infrared furnace ..... common for other operations
- o Solder resist (SR-31G-30 by TAMURA SEISAKUSHO CO.)
- o Thinners

(23) Flux Coating or Solder Plating:

This process is not necessarily required either. This process is, however, provided to make work easier more reliable as well as to prevent copper foil oxidation by coating the front surface of the copper foil, where soldering is performed with flux, so that the parts will be mounted securly. Other techniques include chemical plating with such metals as tin and gold, and molten solder plating. However chemical plating is not employed in the proposed plan.

Solder plating is performed by dipping the board in a solder bath in a subsequent process. Flux is applied by dipping the board in a liquid made of a flux of rosin and solvent such as alcohol solution. The board is then dried.

Equipment and Material Used:

- o Tray
- o Soldering bath ..... common for other operations
- o Flux (TAMURA SEISAKUSHO CO.)
- o Solvent (ethyl alcohol)

(10') Assembly:

A method almost the same as those for thin and thick films is used. The parts are mounted by inserting them in the holes provided in the board and dipping the under side of it in a solder bath or securing the parts with a soldering iron. The solder is composed of 60% Sn and 40% Pb by weight. This composition is not special.

Equipment and Material Used:

- o Soldering bath, soldering iron
- o Solder (Pb/Sn solder)
- o Rinsing liquid (Ethyle alcohol)

- o Flux
- o Parts to be mounted (transisotrs, ICs, diodes, resistors, capacitors)

V. Common Equipment

There is a variety of equipment that can be commonly used for more than two purposes, in contrast to the equipment used exclusively for one process. This common equipment is appropriate for various applications.

These are:

- o Deionized water supplier (Model DA-125 by YAMATO KAGAKU CO.)
  Used to supply deionized water through a pipe line to any location when it is required.
- o Compressor with demoisturer (Model SP-5S4-F by HITACHI SEISAKUSHO CO.)
  Used to supply dry air for blowing off water from washed parts, and for drying equipment.
- o Vacuum set (Model G-20D by NIPPON SHINKU KOKI CO.)
  Connected through a pipe line to each process where the contact fitting of boards is performed and to the contact printer that uses a vacuum.
- o Microscope for inspection (Model SZ-2, BHM-311 by OLYMPUS KOGAKU CO.)
  Used for various inspections and dimension measurements in the processes.
- o Sink
  Connected with normal water supply and used for various cleaning operations
- o Clean bench, clean bench with sink
  Such processes that do not allow the contamination such as mask aligning, etc. or the cleaning process with deionized water are all carried out at these locations.
- o Refrigerator, storage room
  Those photo resists, screen printing paste, chemicals, etc. which could deteriorated under normal atmospheric conditions are all stored in a cool and dark place.
- o Tools and fittings (Tweezers, filter paper, beaker, etc.)

Section 14 CIRCUIT COMPONENT

Spec. No.	SPECIFICATIONS
14.1	Manufacturing Equipment for Fixed Carbon Film Resistor
14.2	Manufacturing Equipment for Ceramic Capacitors
14.6	High Sensing X–Y Recorder
14.7.1	Low Temperature Storage
14.7.2	Large Size Electric Refregerator
14.8	Metal Construction Dryer
14.9	Vibration Tester

S-14

Spec. No. 14.1
Manufacturing Equipment for Fixed Carbon Film Resistor
(All items in JIS C6402)

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: One (1) complete set

3. Contents of Equipment:

(1) Cap Squeezer

Method:	Manual operation, universal type (with exchangeable nozzles for various types)
Model:	RTC-H
Weight:	6 kg
Name of manufacturer:	RIKEN DENGU SEIZO CO.

(2) Thread Cutter

Method:	Manual operation, universal type (with exchangeable chuck for various types)
Model:	RCM-H
Weight:	50 kg
Name of manufacturer:	RIKEN DENGU SEIZO CO.
Composition:	1) Threader Motor 1 ϕ, 100 V, 100 VA High-speed rotating axle Work table dimensions; 750W x 700D x 700H (mm) 2) Pitch base 3) Pitch, chuck, threading tool 4) Autoswitching trimming meter (CS-N-YTR) 100 V, 0.1 VA Set resistance value: 10 Ω – 11 MΩ 5) Chip ejector

Spec. No. 14.1

6) Others:
Magnifying glasses, machine oil, dressor, brush, left hand side chuck

(3) Overload Tester (fitted with AC load power source and load base)

Model:	RAC-24
Input:	1 ϕ, 100 V, 50/60 Hz, 500 VA
Output:	1 ϕ, 0 - 2,400 V, 4 - 0.1 A
Weight:	60 kg
Dimensions:	560W x 350D x 450H (mm)
Name of manufacturer:	RIKEN DENGU SEIZO CO.

(4) Dryer (fitted with safety door and thermostat)

Method:	Foreced hot blast circulation type
Model:	SPS-23F (modified)
Temperature range:	+40°C – +200°C
Internal dimensions:	600W x 600D x 600H (mm)
External dimensions:	1,190W x 790D x 1,520H (mm)
Weight:	170 kg
Power source:	1 ϕ, 220 V, 50 Hz, 2.7 KVA
Name of manufacturer:	TABAI SEISAKUSHO CO.

(5) Marker Machine (a modified model to comply with RIKEN specification)

Method:	Semi-automatic
Printing method:	Mono-color relief off-set printing
Material to be printed:	Small size products of various type of materials and in various shapes
Printing speed:	12 – 42 pcs./min.
Model:	CC/1-EB
Weight:	40 kg
Dimensions:	600W x 400D x 400H (mm)
Power source:	100 V, 50/60 Hz, 65 VA (non-step variable speed)
Name of manufacturer:	NIPPON KYOKUMEN INSATSUKI CO.

Spec. No. 14.1

(6) Ohmmeter (digital)

Method:	Feed back type, pulse width modulation counting method (integral type)
Model:	#2501, #2511 – 30
Maximum indication:	119000, Full 5 digits
Measuring range:	100 Ω (resolving power: 1 mΩ) – 100 MΩ
Range of working temperature:	0 – +45°C
Range of working humidity:	80% R.H. or less (0 – +30°C) 70% R.H. or less (30 – +45°C)
Warming-up time:	Approx. one (1) hour
Dimensions:	430W x 476D x 149H (mm)
Weight:	16.5 kg
Power source:	1 ϕ, 100 ± 10 V, 50/60 Hz, 55 VA
Name of manufacturer:	YOKOGAWA DENKI SEISAKUSHO CO.

(7) Others

As attached sheets.

S-14

Spec. No. 14.1

Item No.	Description	Specification	Q'ty	Unit	Remarks
1.	AC volt meter	YOKOGAWA Model: 2052-05 Voltage: 3/7.5/15V	1	unit	
2.	AC volt meter	YOKOGAWA Model: 2052-06 Voltage: 15/30/75V	1	unit	
3.	AC volt meter	YOKOGAWA Model: 2052-07 Voltage: 75/150/300V	1	unit	
4.	Circuit meter	YOKOGAWA Model: 3201-00 with 3202 case	1	unit	
5.	Initial resistance detector	SANWA DENKI KEIKI K.K. fitted with detector base Ohmmeter: SR-3Y (10Ω - 100KΩ)	1	unit	
6.	Heater transformer	Input: AC 100V Output: AC 0 - 12V (5A)	1	unit	
7.	Voltage regulator	Input: AC 100V Output: AC 0 - 130V (5A)	1	unit	
8.	Transformer for instrument	YOKOGAWA Model: 2267 - 05 Voltage: 3,300V	1	unit	
9.	Thermometer	Mercury, 0 – +360°C 450 mm long	2	ea.	
10.	Graduated measuring cylinder	Made from glass Capacity of 200 (cc)	2	ea.	
11.	Stirring bar	Made from glass 5ϕ(mm) x 200ℓ(mm)	2	ea.	
12.	Desiccator	Normal type, made from glass 300ϕ(mm) with core plate	1	pc.	
13.	Wide-mouth bottle	Made from glass Capacity: 100 (cc) 5 x white color, 5 x brown color	10	ea.	

S-14

Spec. No. 14.1

Item No.	Description	Specification	Q'ty	Unit	Remarks
14.	Wide-mouth bottle	Made from glass Capacity: 200 (cc) 5 x white color, 5 x brown color	10	ea.	
15.	Funnel	Made from glass, 105 mm	1	ea.	
16.	Funnel	Made from glass, 180 mm	1	ea.	
17.	Gravimeter	Set of 7 ea. Specific gravity: 0.7 - 2.00	1	set	
18.	Vernier calipers	200 (mm)	1	unit	
19.	Micrometer	0 - 25 (mm) with holder base	1	unit	
20.	Dryer frame	Dimensions: 196W x 310D x 15H (mm) for 1/8, 1/4, 1/2 P, 100 pcs./frame	40	pc.	
21.	Dryer frame	Dimensions: 196W x 310D x 15H (mm) for 1, 2 P, 60 pcs./frame	40	pc.	
22.	Process box (large)	Plastic, with lid 160W x 200D x 110H (mm)	50	pc.	
23.	Process box (small)	Plastic, with lid 90W x 120D x 30H (mm)	50	pc.	
24.	Beaker	100 (cc), 500 (cc), 1,000 (cc) Made from glass, 5 pcs. each	15	pc.	
25.	Petri dish	Made from glass, 100 ϕ	5	ea.	
26.	Gauze	30W (cm) x 10 (m)	2	bag	
27.	Polyethylene bag (large)	180W x 280H x 0.05t (mm)	500	pc.	
28.	Polyethylene bag (medium)	110W x 180H x 0.05t (mm)	500	pc.	
29.	Polyethlene bag (small)	70W x 130H x 0.05t (mm)	1,000	pc.	
30.	Polyethylene sealer	100 V, 50 W	1	pc.	Seal for bag

Spec. No. 14.1

Item No.	Description	Specification	Q'ty	Unit	Remarks
31.	Celophane		100	pc.	Seal for bag
32.	Rubber plate		1	pc.	
33.	Wasted cloth		1	kg	Rags
34.	Nylon gloves	Large	1	dz.	
35.	Painting brush (for painting)	Flat tip 6 each of Nos. 0, 4, 10	18	pc.	
36.	Rubber stamp	For indications of resistance values, E-6 series, all resistance values (±5%)	37	pc.	
37.	Resistance value detector base	Fitted with detector terminals and base for 1/8, 1/4, 1/2 P	1	set	Approx. 8cm x 6cm size
38.	Resistance value detector base	Fitted with detector terminals and base for 1, 2 P	1	set	
39.	Lead wire elongating wood base	For 1/8, 1/4, 1/2 P	1	set	
40.	Lead wire elongating wood base	For 1, 2 P	1	set	
41.	Tool set	With case	1	set	
42.	Bamboo tweezers		1	set	
43.	Small hammer		1	pc.	
44.	Screw driver		1	pc.	
45.	Vynil cord	100 V, 10 A	100	m	
46.	Plug	100 V, 10 A	10	pc.	
47.	Alligator clip	20 pcs. each of red and black	40	pc.	
48.	Table tap	100 V, 10 A, 3 P	4	pc.	
49.	Thread solder	1.5 ϕ, 1 kg	1	roll	
50.	Vynil tape		2	pc.	
51.	Double-face adhesive tape	Scotch	1	pc.	

S-14

Spec. No. 14.1

Item No.	Description	Specification	Q'ty	Unit	Remarks
52.	Screw	For fixing cap squeezer	10	pc.	
53.	Screw	For attaching to products	200	pc.	
54.	1/8 P carbon coated sample	2 Ω - 5 KΩ (6 kinds)	10,000	pc.	
55.	1/4 P carbon coated sample	2 Ω - 5 KΩ (6 kinds)	10,000	pc.	
56.	1/2 P carbon coated sample	2 Ω - 5 KΩ (6 kinds)	6,000	pc.	
57.	1 P carbon coated sample	2 Ω - 5 KΩ (6 kinds)	5,000	pc.	
58.	2 P carbon coated sample	2 Ω - 5 KΩ (6 kinds)	4,000	pc.	
59.	1/8 P cap	Fitted with lead wire	20,000	pc.	
60.	1/4 P cap	Fitted with lead wire	20,000	pc.	
61.	1/2 P cap	Fitted with lead wire	12,000	pc.	
62.	1 P cap	Fitted with lead wire	10,000	pc.	
63.	2 P cap	Fitted with lead wire	8,000	pc.	
64.	Primary paint	2 kg	1	can	
65.	Finishing paint	2 kg	1	can	
66.	Lacquer thinner	18 ℓ	1	can	
67.	Silicagel		2	kg	
68.	Marker ink	Black color	1	pc.	
69.	Thinner (for primary paint)	18 ℓ	1	can	
70.	Thinner (for finishing paint)	18 ℓ	1	can	
71.	Works instruction manual		1	set	(In English or Japanese)
72.	Manufacturing instruction manual		1	set	(In English or Japanese)

Spec. No. 14.1

Notes:

1. A name plate, on which name of item, date manufactured, serial number, name of manufacturer are described in English, is to be attached to the panel or metal casing and cover. All other descriptions on the panel are to be in English.
2. The color is to be of manufacturer's standard.
3. Manufacturer (Nominated): RIKEN DENGU SEIZO CO.

4. Materials to be submitted:
   3 copies of Operational instruction manual in Japanese, 3 copies of Test result sheet, 3 copies of the Catalogue, 4 copies each of Invoice and Packing list (of which one copy each is to be attached to the equipment).

S-14

Spec. No. 14.2

Manufacturing Equipment for Ceramic Capacitors

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: As specified in appendixes attached.

3. Standards: (Constructional Dimensions, Electrical Requirements, Necessary Mechanical Requirements, etc.)
   As specified in appendixes attached.

   Notes:
   1. A name plate, on which name of item, date manufactured, serial number, name of manufacturer are described in English, is to be attached to the panel or metal casing and cover. All other descriptions on the panel are to be in English.
   2. The color is to be of manufacturer's standard.
   3. Manufacturer (Nominated): YAMATO KAGAKU CO.

4. Materials to be submitted:
   5 copies of Operational instruction manual in English, 3 copies of the same but in Japanese, 3 copies of Test result sheet, 3 copies of the Catalogue, and 4 copies each of Invoice and Packing list (of which one copy each is to be attached to the equipment).

5. Appendixes

   (1) Precision Scientific Analytical Balances

Quantity:	One (1) unit
Manufacturer and model:	KENSEI KOGYO CO., KY-2
Capacity:	200 g
Limit of reading:	0.01 mg
Range of projected scale:	0 - 100 mg
Dimensions:	330(W) x 420(D) x 470(H) mm
Power source:	AC 100 V, 1 ϕ

Spec. No. 14.2

(2) Top-pan Type Direct Indication Balances

Quantity:	One (1) unit
Manufacturer and model:	KENSEI KOGYO CO., S-400
Capacity:	4,000 g
Max. capacity:	6,000 g
Limit of reading:	0.1 g
Standard deviation:	0.05 g
Power source:	AC 100 V, 1 ϕ

(3) Mixing and Grinding Machines

Quantity:	One (1) unit
Manufacturer and model:	Ishikawa Type Mixing and Grinding Machine, Model AGA
Motor:	120 mmϕ, 30 mm depth
Material:	Agate
Dimensions:	480(W) x 420(D) x 1,170(H) mm
Power source:	AC 100 V, 1 ϕ, 200 W

(4) Universal Ball Mill

Quantity:	One (1) unit
Manufacturer and model:	YAMATO KAGAKU CO., UB-31
Roller:	50 (dia.) x 650 (L) mm
Rotating speed of roller:	200 - 600 r.p.m. non-step variable speed
Motor:	Condensor type (torque motor) 70 W
Dimensions:	1,010(W) x 410(D) x 380(H) mm
Power source:	AC 100 V, 1 ϕ, for both 50/60 Hz

(5) Constant Temperature Drying Oven

Quantity:	One (1) unit
Manufacturer and model:	YAMATO KAGAKU CO., DZ-33
Range of temperature:	Room temp. – 200°C
Internal dimensions:	300(W) x 300(D) x 300(H) mm
Interior material:	Stainless steel
External dimensions:	380(W) x 380(D) x 560(H) mm
Power soruce:	AC 100 V, 1 ϕ, 900 W

Spec. No. 14.2

(6) Sieves

Quantity:	One (1) unit
Manufacturer and model:	HEIKO SEISAKUSHO, CO., Low tap type
Shieving speed:	290 r.p.m.
Amplitude:	25 mm
Tampering:	156 t.p.m.
Number of shieves:	8 (150, 200 ϕ x 45 mm)
Hammer weight:	2.2 kg
Timer:	60 min.
Power source:	AC 100 V, 200 W

(7) Muffle Furnace

Quantity:	Two (2) units
Manufacturer and model:	YAMATO KAGAKU CO., FM-21
Range of temperature:	100°C - 1,150°C
Accuracy of temperature:	±10°C
Thermostat:	Indicated regulator meter; 0°C - 1,200°C 2-position control method by use of thermocouple
Heating element:	Kankar A_1 line
Internal dimensions:	100(W) x 200(D) x 100(H) mm
External dimensions:	Furnace body section; 340(W) x 510(D) x 420(H) mm Control section; 440(W) x 510(D) x 170(H) mm
Power source:	AC 100 V, 1 ϕ, 2 kW

(8) Muffle Furnace

Quantity:	One (1) unit
Manufacturer and model:	YAMATO KAGAKU CO., FMH-3
Range of temperature:	100°C - 1,450°C Working temperature; 1,350°C
Thermostat:	Regulator unit, recorder (0 - 1,600°C), program setter, thermoelectric temperature converter
Heating element:	Silicon carbide heating element
Internal dimensions:	150(W) x 300(D) x 100(H) mm

Spec. No. 14.2

Power source: AC 100 V, 1 ϕ, 8.0 kW

(9) Materials of Equipments

Item No.	Description	Specification	Q'ty	Unit	Remarks
1.	Beaker	50 ml 100 ml 200 ml 500 ml 1,000 ml	5 10 10 10 10	pc. pc. pc. pc. pc.	
2.	Graduated measuring cylinder	100 ml 200 ml 500 ml 1,000 ml	5 5 5 5	pc. pc. pc. pc.	
3.	Petri dish	Hard 45 mmϕ 100 mmϕ 150 mmϕ	20 20 20	pc. pc. pc.	
4.	Spoon	Made of stainless steel, 150 mm Made of calf bone, 150 mm	5 3	pc. pc.	
5.	Glass bar	1.5 m long, 5 mmϕ			Made of pylex
6.	Medicine wrapping paper	Contains 500 pcs. (medium)	30	box	
7.	Beaker brush	with wooden handle	10	pc.	
8.	Material of $B_aT_iO_3$ family	BT – 100 BT – 204 BT – 303	25 25 25	kg kg kg	
9.	Material of T_iO_2 family	NP – 0 NO – 750 TC – 200	25 25 25	kg kg kg	
10.	Conductive silver paste	#6320 Toluene for 8250	1,000 1,000	g g	
11.	Writing brush		20	pc.	
12.	Binder	PVA (No.): 500	500	g	(as made by KANTO KAGAKU

Spec. No. 14.2

Item No.	Description	Specification	Q'ty	Unit	Remarks
12.	Binder	Liquid paraffin (1st class)	500	g	
13.	Coating material	Epoxy SF-1 Acetone: Methanol mix	20 20	kg kg	
14.	Hot plate	HK-41 Range of temperature; 50 - 250°C 550(W) x 300(D) mm	1	unit	
15.	Table press	TOYO SEIKI No. 519 max. 5 t pressure	1	unit	
16.	Metal die	5 mmϕ 8 mmϕ 10 mmϕ 5 x 5 mm 8 x 8 mm 10 x 10 mm	1 1 1 1 1 1	set set set set set set	
17.	Crucible pinch	TGK, made of stainless steel, 45 cm	3	pc.	
18.	Crucible	Type A 96(O.D) x 65(H) mm Capacity; 265 ml	30	pc.	
19.	Gloves	Asbestos	3	pair	
20.	Hydrochloric acid	500 ml, 1st class, as manufactured by KANTO KAGAKU K.K.	10	pc.	
21.	Universal bridge	as manufactured by YHP, Model 4260A	1	unit	
22.	Super ohmmeter	as manufactured by TOA DENPA, Model SM-15			
23.	Withstand voltage tester	as manufactured by KIKUSUI DENSHI, Model 875C	1	unit	
24.	Compact vacuum pump	Model PS-05 5 ℓ/min. displacement	1	unit	

Spec. No. 14.2

Item No.	Description	Specification	Q'ty	Unit	Remarks
25.	Filter bottle	5,000 ml	1	pc.	
26.	Porcelain filter funnel	160 mmϕ inside diameter	1	pc.	
27.	Filter paper	TOYO ROSHI (100 pcs.)	1	box	
28.	Vacuum rubber tube	1 m, 7.5 mmϕ x 21 mmϕ	1	m	
29.	Rubber plug		1	pc.	
30.	Steel scrubbing brush		2	pc.	
31.	Cleanser	for household use	30	pc.	
32.	Spinner	Fitted with vacuum pump as manufactured by MIKASA SEISAKUSHO	1	set	(for 2")
33.	Tray	Stainless steel, octavo size	10	pc.	
34.	Mortars	Porcelain, hard, 150 mmϕ with pestle	5	pc.	
35.	Alumina crucible	Type A, 265 ml capacity with lid	30	pc.	
36.	Vacuum desiccator	300(D) x 300(W) x 300(H) mm	1	set	Made of transparent acryl

S-14

Spec. No. 14.6
High Sensing X–Y Recorder

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: One (1) unit

3. Standards: (Constructional Dimensions, Electrical Requirements, Necessary Mechanical Requirements, etc.)

3.1 Dimensions, Weight

Approx. 399 x 430 x 153 mm, approx. 15 kg

3.2 Data

Servo method:	High frequency modulation type servo method
Range of measurement of voltage:	0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50 mV/cm 0.1, 0.2, 0.5, 1, 2, 5, 10 mV/cm for both X, Y axes
Input resistance:	1 MΩ
Telerance:	Effective recording width ±3%
Detecting sensibility:	Effective recording width ±0.15%
Running speed of pen:	Approx. 1 second or less against effective recording width
Time axis:	0.5, 1, 2, 5, 10 s/cm (5-step switching)
Effective recording width:	250 mm x 250 mm
Recording paper:	270 mm x 20 mm
Power source:	AC 100 V, 50 Hz

Notes:

1. The color is to be of manufacturer's standard.
2. Anything but those specified in this specifications are subject to the manufacturer's catalogue.
3. Designated manufacturer: YEW, Model 3077

Spec. No. 14.6

4. Accessories and Spare Parts:
Recording paper (20 m roll) x 10 rolls and ink (red and green, 500 cc each) are to be provided as spares.

5. Materials to be submitted:
5 copies of Operational instruction manual in English, 3 copies of the same but in Japanese, 3 copies of Test result sheet, 3 copies of the Catalogue, and 4 copies each of Invoice and Packing list (of which one copy each is to be attached to the equipment).

6. Remarks:

S-14

Spec. No. 14.7.1
Low Temperature Storage

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: One (1) unit

3. Standards: (Constructional Dimensions, Electrical Requirements, Necessary Mechanical Requirements, etc.)
This item is the storage to be used for storing chemicals, specimens, etc.

3.1 Construction, Dimensions
(1) To be of pre-fabricated for easier assembly and disassembly.
(2) Dimensions are to be approx. 180 x 90 x 190 cm and capacity is to be approx. 2,400 ℓ.
(3) Must have variable multi-shelving.

3.2 Features
(1) Range of temperature: -2°C, Normal temperature
(2) Refregerator: Single-phase, AC 220V (or AC 100V), approx. 400 W

Notes:
1. A name plate, on which name of item, date manufactured, serial number, name of manufacturer are described in English, is to be attached to the panel or metal casing and cover. All other description on the panel are to be in English.
2. The color is to be of manufacturer's standard.
3. Designated Manufacturer: DAIKYO KIKAI SEISAKUSHO, CO., Model LP-0.5-2G

4. Materials to be submitted:
5 copies of Operational instruction manual in English, 3 copies of the same but in Japanese, 3 copies of Test result sheet, 3 copies of the Catalogue, and 4 copies each of Invoice and Packing list (of which one copy each is to be attached to the equipment).

5. Remarks:

S-14

Spec. No. 14.7.2
Large Size Electric Refregerator

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: One (1) unit

3. Standards: (Constructional Dimensions, Electrical Requirements, Necessary Mechanical Requirements, etc.)
   (1) Capacity is to be approx. 428 ℓ
   (2) To be fitted with temperature regulator lever.
   (3) Weight is to be approx. 130 kg
   (4) Power source: 100 V, 50 Hz

   Notes:
   1. The color is to be of manufacturer's standard.
   2. Anything but those specified in this specifications are subject to the manufacturer's catalogue.
   3. Designated Manufacturer: TOKYO SHIBAURA DENKI CO.,
      Model GR 4807FD

4. Materials to be submitted:
   5 copies of Operational instruction manual in English, 3 copies of the same but in Japanese, 3 copies of Test result sheet, 3 copies of the Catalogue, and 4 copies each of Invoice and Packing list (of which one copy each is to be attached to the equipment).

5. Remarks:

S-14

Spec. No. 14.8
Metal Construction Dryer

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: One (1) unit

3. Standards: (Constructional Dimensions, Electrical Requirements, Necessary Mechanical Requirements, etc.)
This item is to be used for storing electronic parts.

3.1 Construction, Dimensions
(1) To be of laterally opening door type and be easily opened/closed.
(2) Sliding shelves can be installed inside.
(3) Inside surfaces are to be of stainless steel.
(4) External dimensions are to be approx. 860 x 1,000 x 460 mm.
(5) Preferably of 4-door type.

3.2 Function
To be able to provided with high dehydration effect by furnishing silicagel.

Notes:
1. A name plate, on which name of item, date manufactured, serial number, name of manufacturer are described in English, is to be attached to the panel or metal casing and cover. All other descriptions on the panel are to be in English.
2. The color is to be of manufacturer's standard.
3. Anything but those specified in this specifications are subject.to the manufacturer's catalogue.
4. Designated Manufacturer: TOKYO CATHODE KENKYUSHO., CO., Model D-3

4. Accessories and Spare Parts:
3 kg of silicagel is to be furnished.

Spec. No. 14.8

5. Materials to be submitted:
   5 copies of Operational instruction manual in English, 3 copies of the same but in Japanese, 3 copies of Test result sheet, 3 copies of the Catalogue, and 4 copies each of Invoice and Packing list (*of which one copy each is to be attached to the equipment*).

6. Remarks:

S-14

Spec. No. 14.9

Vibration Tester

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: One (1) each unit of equipment described below.

3. Standards: (Constructional Dimensions, Electrical Requirements, Necessary Mechanical Requirements, etc.)

(1) Compact Vibration Applying Equipment

Maximum vibration applying force:	15 kg (0 - 100 Hz), 10 kg (0 - 200 Hz), 7.5 kg (0 - 8.5 Hz)
Maximum acceleration:	34 G
Range of frequency:	0 - 8,500 Hz
Maximum amplitude:	10 mm_{p-p}
Weight of moving section:	0.45 kg
Diameter of vibration applying base:	44 mmϕ
Maximum loading weight:	2 kg
Dimensions:	280 x 265 x 230 mm
Weight:	approx. 25 kg
Model:	513-A

(2) Unit Voltage Amplifier

Maximum output:	70 VA
Range of frequency applicable:	5 Hz - 10 kHz
Characteristic of frequency:	within 5 Hz - 5 kHz ±3 dB
Distortion factor:	10 Hz - 5 kHz, less than 1%
S/N ratio:	70 dB
Input voltage:	maximum 3 V rms
Power source:	AC 100 V, 50 Hz
Dimensions:	approx. 368 x 315 x 206 mm
Model:	360-B

Spec. No. 14.9

(3) Portable Vibration Meter

Pick-up used:	541-AT type acceleration Pick-up (piezo-electricity type) accessory
Measuring items:	Acceleration, velocity, displacement
Range of measurement:	Acceleration; 0.01 - 1,000G (2 Hz - 10 kHz) Velocity; 0.1 cm/sec. - 30,000 cm/sec. (3Hz - 30Hz) 0.1 mm/sec. - 3,000 cm/sec. (30Hz - 3kHz) Deplacement: 0.1 mm - 1 m (3Hz - 30Hz) 1 μm - 3 cm (30Hz - 300Hz) 0.01 μm - 3 mm (300Hz - 3 kHz)
Accuracy:	Less than 5% (by sin wave conversion except acceleration)
Input impedance:	500 MΩ or more
Output impedance:	200 Ω or less
Connectable minimum:	200 Ω
Load resistance:	
Amplification degree:	68 dB ±5 dB
Output voltage:	2.8 V P-P (200 Ω load)
Output current:	14 mA P-P (200 Ω load)
Noise level:	50 μV or less (input conversion)
Power source:	AC 100 V ±5 V, or built-in cell
Dimensions:	158(W) x 165(D) x 208(H) mm
Weight:	approx. 5 kg
Model:	505-D

(4) RC Oscillator

Power source:	AC 100 V, 50 Hz
Dimensions:	200 x 140 x 275 mm (approx.)
Weight:	approx. 4.5 kg
Oscillation frequency:	5 Hz - 500 kHz (5 ranges)
Output waveform:	Sin wave and quadrad wave

S-14

Spec. No. 14.9

Output voltage:	3 V rms or more with 600 Ω load (sin wave) 6 $V_{p\text{-}p}$ or more with 600 Ω load (quadrad wave)
Output impedance:	*600 Ω ±3% (at 1 kHz)*
Model:	417 A as manufactured by KIKUSUI DENSHI CO.

Notes:

1. A name plate, on which name of item, date manufactured, serial number, name of manufacturer are described in English, is to be attached to the panel or metal casing and cover. All other descriptions on the panel are to be in English.
2. The color is to be of manufacturer's standard.
3. Anything but those specified in this specifications are subject to the manufacturer's catalogue.
4. Manufacturer (Nominated): SHIN NIPPON SOKKI CO.

4. Materials to be submitted:
5 copies of Operational instruction manuals in English, 3 copies of the same but in Japanese, 3 copies of Test result sheets, 3 copies of the Catalogues, and 4 copies each of Invoice and Packing list (of which one copy each is to be attached to the equipment).

EXPLANATION FOR MANUFACTURING SYSTEM OF FIXED CARBON FILM RESISTOR

1. Purpose

This system is used to manufacture (except the process for coating carbon film) non-insulation type fixed carbon film resistors used for telecommunication equipments, electrical measurement equipments and other equipments with application of electronics.

1.1 Construction of Resistor

Consists of protective painting furnished over the resistor, which has been formed by carbon film that deposited by vapor phase decomposition on the surface of elementary porcelain bar, fitted with cap terminals.

1.2 Style, Dimensions and Electric Characteristics of Resistor

The style, dimensions, and electrical and mechanical features of the resistors manufactured by this use of this manufacturing system are comply with provisions of Japanese Industrial Standards (JIS) C6402 (fixed carbon film resistor), (but styles are to be 1/8 - 2P).

1.2.1 Style and Rated Power

The style and rated power are as shown in Table 1.

Table 1. Style and Rated Power

Style	1/8P	1/4P	1/2P	1P	2P
Rated Power (W)	0.125	0.25	0.5	1	2
Max. Working Voltage (V)	250	300	350	500	750
Max. Loaded Voltage (V)	400	600	700	1,000	1,500
Max. Pulse Voltage (V)	500	750	1,000	1,500	2,000

Remarks:

Rated voltage (E) is derived from $E = \sqrt{PR}$ E: rated voltage (V), P: rated current, R: nominal resistance (Ω). When the rated voltage obtained exceeds the value of the max. working voltage shown in Table 1, the max. working voltage is to be considered to be rated voltage.

1.2.2 Dimensions

The dimensions of the resistor manufactured by use of this system are as shown in the Table 2.

Table 2.

Style	L (mm)	D (mm)	d (mm)
1/8P	9 ± 1.5	2.5 ± 1	0.6 ± 1
1/4P	13 ± 1.5	2.5 ± 1	0.6 ± 1
1/2P	15 ± 1.5	4.5 ± 1	0.8 ± 1
1P	24 ± 1.5	7.5 ± 1	0.9 ± 1
2P	52 ± 1.5	7.5 ± 1	0.9 ± 1

L: Length, D: Diameter, d: Diameter of lead

1.2.3 Resistance Range

The resistance range of the resistors manufactured by use of this system is as shown in Table 3.

Table 3. Resistance Range

Unit: Ω

Property	Tolerance of Resistance	1/8P	1/4P	1/2P	1P	2P
X	D	10 - 51K	10 - 51K	10 - 100K	51 - 200K	100 - 200K
	F	10 - 100K	10 - 510K	10 - 1M	10 - 5.1M	30 - 5.1M
X, Y	G	10 - 240K	10 - 1M	10 - 2.2M	10 - 5.1M	330 - 5.1M
X, Y, Z	J	5.1 - 1M	5.1 - 1M	5.1 - 2.2M	5.1 - 5.1M	10 - 5.1M
Y, Z	K	5.1 - 1M	5.1 - 1M	5.1 - 2.2M	5.1 - 5.1M	10 - 5.1M
A	F	51 - 100K	51 - 510K	51 - 1M	51 - 5.1M	51 - 5.1M
	G	51 - 240K	51 - 1M	51 - 2.2M	51 - 5.1M	51 - 5.1M
A, B	J	51 - 1M	51 - 1M	51 - 2.2M	51 - 5.1M	51 - 5.1M
B	K	51 - 1M	51 - 1M	51 - 2.2M	51 - 5.1M	51 - 5.1M

Remarks: Tolerance of Resistance

D(±0.5%), F(±1%), G(±2%), J(±5%), K(±10%)

1.2.4 Electrical and Mechanical Features

The electrical and mechanical features of the resistors manufactured by use of this system are as shown in Table 4.

Table 4. Electrical and Mechanical Features

Characteristics		X	Y	Z
Temperature range to be used (°C)		-55 – 125	-40 – 125	-25 – 125
Max. ambient temperature where rated voltage can be loaded (°C)		40	40	40
Max. ambient temperature where loaded voltage is reduced (°C)		125	125	125
Temperature coefficiency (ppm/°C)	100 KΩ or less	+350 – -350	+350 – -500	+350 – -500
	1 MΩ or less	+350 – -500	+350 – -700	+350 – -700
	1 MΩ or more	+350 – -800	+350 – -1,000	+350 – -800
Maximum tolerance for fluctuation of resistance (±%)	Overload for short period of time	0.75	1	-
	Anti moisture load life (1)	5	10	10
	Load life (2)	1 – 3	2 – 5	2 – 5
	Solder dip	0.5	1	1
	Temperature cycle	1	-	-
	Anti vibration feature	1	-	-
	Pulse characteristics (3)	0.75	-	-
Terminal strength		To withstand for the strength as specified for each style		
Painting		Paint coat shall not easily peel off, neither soften, flash, nor explode at 150°C or less.		
Tolerance for resistance (±%)		0.5, 1, 2, 5	2, 5, 10	5, 10
Range of resistance by tolerance for resistance (Ω) (4)	D (±0.5%)	10 - 200K	-	-
	F (±1%)	10 - 5.1M	-	-
	G (±2%)	10 - 5.1M	10 - 5.1M	-
	J (±5%)	5.1 - 5.1M	5.1 - 5.1M	5.1 - 5.1M
	K (±10%)	-	5.1 - 5.1M	5.1 - 5.1M

Characteristics		A	B
Temperature range to be used (°C)		-55 – 125	-40 – 125
Max. ambient temperature where rated voltage can be loaded (°C)		70	70
Max. ambient temperature where loaded voltage is reduced (°C)		125	125
Temperature coefficiency (ppm/°C)	100 KΩ or less	+350 – -350	+350 – -500
	1 MΩ or less	+350 – -500	+350 – -700
	1 MΩ or more	+350 – -800	+350 – -1,000
Maximum tolerance for fluctuation of resistance (±%)	Overload for short period of time	0.75	-
	Anti moisture load life (1)	55	10
	Load life (2)	2 – 4	3 – 6
	Solder dip	0.5	1
	Temperature cycle	1	-
	Anti vibration feature	1	-
	Pulse characteristics (3)	0.75	-
Terminal strength		To withstand for the strength as specified for each style	
Painting		Paint coat shall not easily peel off, neither soften, flash, nor explode at 150°C or less.	
Tolerance for resistance (±%)		1, 2, 5	5, 10
Range of resistance by tolerance for resistance (Ω) (4)	D (±0.5%)	51 - 5.1M	-
	F (±1%)	51 - 5.1M	-
	G (±2%)	51 - 5.1M	-
	J (±5%)	51 - 5.1M	51 - 5.1M
	K (±10%)	-	51 - 5.1M

Notes:

1. Applicable at 51 KΩ or more.
2. Variable within range shown in the above table by range of resistance.
3. Applicable at 100 Ω or more.
4. Variable within the range shown in above table by style.

1.3 Principal Manufacturing Equipments

This manufacturing system is composed of the principal equipments shown in Table 5.

S-14

Table 5.

Name of Equipment	Unit	Name of Manufacture	Model	Specification	Title of Process
Cap Squeezer	1	RIKEN	RTC-H	Manual, versatile type (exchangeable nozzles for various types) Weight: 6 kg	Cap mounting
Ohmmeter	1	SANWA	SR-3Y	Measuring range: Min. 0.1 Ω - max. 10 MΩ Weight: 1.8 kg	Initial registance assorting
Thread Cutter	1	RIKEN	RCM-H	Manual, versatile type (exchangeable chucks for various types) Weight: 50 kg Composition: *Thread cutter, pitch base,* pitch, chuck, thread cutter tool	Thread cutting
Automatic Switching Trimming Meter	1	SANWA	CS-N-YTR	Set resistance: 10 Ω - 11 MΩ Power source: 100 V, 0.1 VA	Thread cutting
Overload Tester	1	RIKEN	RAC-24	Input: 1φ, 100 V, 50/60 Hz, 500 VA Output: 1φ, 0 - 2,400 V, 4 A - 0.1 A Weight: 60 kg with load base	Application of over-current and performance test
Dryer (with safety door and thermostat)	1	TABAI	SPS-23F (modified)	Power source: 1φ, 200 V, 50/60 Hz, 2.7 KVA Weight: 170 kg Temp. range: +40°C - +200°C	Curing and performance test
Marker Equipment	1	NIPPON KYOKUMEN INSATSU	CC/1-EB	Semi-automatic, monocolor Relief off set printing Power source: 100 V, 50/60 Hz, 65 VA Weight: 40 kg	Marking
Digital Ohmmeter	1	YOKOGAWA	#2501 ohm unit #2511-30	Power source: 1φ, 100 V, 50/60 Hz, 55 VA Measuring range: 100 Ω - 100 MΩ (full 5 digits)	Resistance test and performance test

1.4 Manufacturing Capacity

The productivity for the resistors manufactured by used of this sytem is as shown in Table 6 (in case of types 1/8P)

Table 6. Productivity of the Manufacturing System

Type	1 / 8 P		
Name of Principal Process	No. of Worker	No. of Production	
		per an Hour	per 8 Hours
Capping	1	275	2,200
Initial Resistance Selection	1	1,000	8,000
Thread Cutting (when tolerance is ±5%)	1	125	1,000
Application of Over Current	1	375	3,000
Primary Coating and Drying	1	500	4,000
Finish Coating and Drying	1	500	4,000
Indication and Drying	1	700	5,600
Resistance Test	1	1,000	8,000

Note: The value shown above is the productivity performed by experienced worker.

2. Manufacturing Process

2.1 Diagram for Manufacturing Process

The diagram for manufacturing process by use of this system is as shown in Fig. 2.

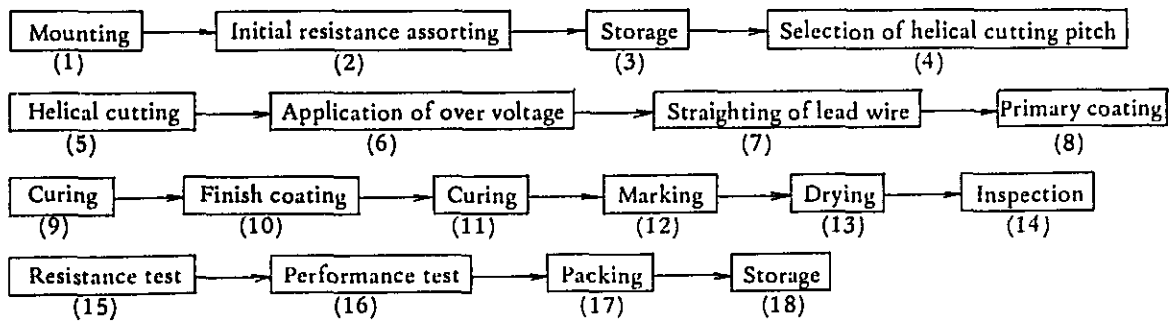


Fig. 2. Diagram for Manufacturing Process
(except carbon film coating process)

2.2 Explanation for Each Manufacturing Process

2.2.1 Cap Mounting

Nozzle for the type is to be mounted on manual, versatile type cap squeezer (RIKEN, model RTC-H) and upon inserting lead cap to inside nozzle, the caps are squeezed in both ends of resistor element.

2.2.2 Initial Resistance Assorting

By using ohmmeter (model SR-3Y, as manufactured by SANWA) initial resistance value are classified by step.

2.2.3 Storage

The resistor elements of which initial resistance value has been measured and classified by step are stored in plastic container boxes together with labels on which initial resistance values are written.

2.2.4 Selection of Helical Cutting Pitch

In order for providing helical cutting with finished resistance value cutting pitch is selected based on the correlation table on which initial resistance values and thread cutting pitches are listed.

2.2.5 Helical Cutting

In order for providing helical cutting with the finished initial resistance values, the automatic switching resistance trimming meter (model CS-N-YTR as manufactured by SANWA) is to be set at the finished resistance value. Then, grooves are cut as helically cutting carbon film that is adhering to the surface of resistor element by monitoring meter with manual, versatile type thread cutter (model RCM-H as manufactured by RIKEN). By means of the groove cut, the resistance value could be adjusted to the objective resistance value by gradually increasing the resistance value of carbon film.

2.2.6 Over Voltage Application

In order to check the resistor to eliminate faulty helical cutting, over voltage is applied continually for short period of time by use of AC over loading tester (model RAC-24 as manufactured by RIKEN).

And those occuring spark or burn are to be rejected as faulty.

2.2.7 Straightening of Lead Wire

In order to make painting work easier, the lead wires are straightened on wooden table for the purpose.

2.2.8 Primary Coating

In order for providing protection with carbon film against atmosphere, vapor-proof insulation paint for under coating is printed (by brush) evenly over the surface of elemental bodies and are put in line on dryer frame. Numbers of coating are varied depending on the resistance value.

2.2.9 Curing

After curing at room temperature took place for short period of time, the drying frame, on which resistor elements are arranged, is put into dryer over (model SPS-23F as manufactured by TABAI) for high temperature curing for under coating film.

2.2.10 Finish Coating

After curing of primary coating completed, vapor-proof insulation paint is painted (by brush) evenly over the under coating for providing face coating with elemental resistor bodies, and are then arranged in line on curing frame.

2.2.11 Curing

After curing at room temperature took place for short period of time, the curing frame, on which resistor elements are arranged, is put into dryer over for high temperature curing for finish coating film.

2.2.12 Marking

After curing of finish coating completed, the resistance value is printed over the finish coat on marker equipment (model CC/1-EB as manufactured by NIPPON KYOKUMEN INSATSU), and then the resistor elements are arranged on curing frame.

2.2.13 Curing

The curing frame, on which arranged are the resistant elements, is put into dryer oven (model SPS-23F as manufactured by TABAI) for high temperature curing.

2.2.14 Appearance Inspection

Visual inspection on bubbles in film coat, uneven painting, unreadable marking, etc. is performed.

2.2.15 Resistance Value Test

Resistance values of completed resistors are tested to determine if they are within the tolerance (for example: ±1%, ±2%, ±5% of set value) on digital ohmmeter (model #2501 as manufactured by YOKOGAWA). Those exceeding the tolerance are rejected as faulty.

2.2.16 Performance Test

Various performance tests are given at random based on the standards provided.

Notes: The items of tests can be performed with the testers and loading power source included in this system are as follows (test jigs are required to be fabricated):

1. Dimensions check (equipments to be used; slide vernier and micrometer)
2. Resistance temperature characteristics (equipments to be used; digital ohmmeter and dryer oven)
3. Overload characteristics for short period of time (equipments to be used; digital ohmmeter, AC load power source, voltage regulator, heat transformer and various voltmeter)

2.2.17 Packing

The completed resistors for protection against atmosphere, are put in polyethylene bag and sealed, together with label on which type and resistance value are written.

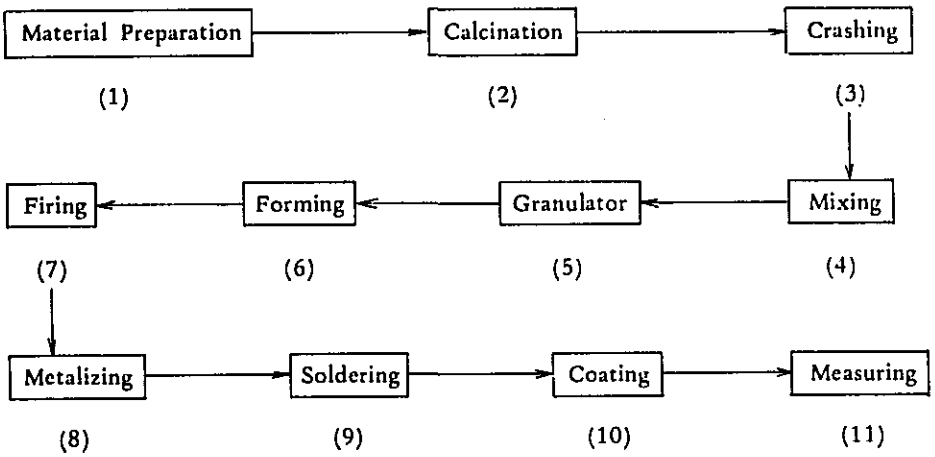
2.2.18 Storage

The resistors in polyethylene bags are put in plastic container box for storage.

S-14

EXPLANATION FOR MANUFACTURING SYSTEM OF CERAMIC CAPACITORS

1. Process Flow Chart



2. Explanation for Each Manufacturing Process

2.1 Materials Preparation

The raw material is weighed using balances and an appropriate weight (usually 100 g – 200 g) is put into a polyethylene pot with a lot of agate pieces and deionized water. The pot is placed on a universal ball mill and rotated for 4 hours for the adequate mixing. The mixed material is put on a porcelain filter funnel on a filter bottle. The filter bottle is pumped for the dehydration. The dehydrated material is wrapped with a sheet of paper and dried at 80°C for 24 hours in a drying oven.

Equipment and Materials to be used:

1. Precision scientific analytical balances
2. Top-pan type direct indication balances
3. Universal ball mill (with pots and pieces of agate)
4. Constant temperature drying oven
5. Material of $BaTiO_3$ family
6. Material of TiO_2 family
7. Filter bottle

8. Porcelain filter funnel
9. Filter paper
10. Spoon
11. Petri dish
12. Medicine wrapping paper
13. Compact vacuum pump
14. Vacuum rubber tube
15. Rubber plug

2.2 Calcination

The dried material is put into a crucible. The crucible with the material is heated at 1,150°C for a hour in a muffle furnace for the calcination.

Equipment and Materials to be used:

1. Muffle furnace
2. Crucible
3. Crucible pinch

2.3 Crashing

The material is taken out from the crucible and put into a mortar with binder. The binder is 10 wt.% aqueous solution of polyvinyl alcohol (PVA). The amount of the binder to be added is 8 wt.% of the material. Then, the material is crashed by a pestle manually.

Equipment and Materials to be used:

1. Binder (PVA)
2. Beaker
3. Glass bar
4. Graduated measuring cylinder

2.4 Mixing

The mortar with the material is placed in a mixing and grinding machine. The material is mixed by the machine for 20 minutes.

Equipment and Materials to be used:

1. Mixing and grinding machine (with a mortar and a pestle)

2.5 Granulation

Grain sizes of the material are selected between 250 μm and 400 μm by using sieves. The material with smaller or larger grain sizes are mixing in a mortar manually for changing the grain sizes. The material with changed grain sizes are put into sieves again. This procedure is repeated in several times.

Equipment and Materials to be used:

1. Sieves
2. Mortar

2.6 Forming

The material with uniform grain sizes is weighed and put into a metal die. Six sizes of metal dies are prepared for various applications. The metal die is oscillated manually until a material surface becomes flat. The forming of material is done by using a table press at a pressure of 1 ton/cm^2. A thickness of the disk (formed material) is measured by a micrometer.

Equipment and Materials to be used:

1. Table press
2. Metal dies
3. Micrometer (common to Spec. 14.1)
4. Spoon

2.7 Firing

The disks are placed in rows and columns and piled up on a zirconia ceramic plate which is on a almina ceramic plate. The disks can be piled up to ten pieces. About 400 pieces of disks are fired at once. The almina ceramic plate with the disks is put into a muffle furnace which is a different type used for the calcination. High purity oxigen gas must be flown through the furnace at a flow rate of 1 ℓ/min preventing the reduction of the samples.

The furnace is heated up to 1,450°C by a temperature rising rate of 100°C/hour and held for two hours for binder vaporing at 400°C on the way of the temperature rising. The furnace is held at 1,450°C for 24 hours, then cooled down by a descending rate of 100°C/hour. When the temperature becomes 1,000°C, the heater of the furnace is turned off. Samples can be taken back with an asbesto glove from the furnace, when

it is cooled down to 300°C.
Some disks sticked together are separated each other by a striking with a wooden hammer.

Equipment and Materials to be used:

1. Muffle furnace (with almina ceramic plates and zirconia ceramic plates)
2. Hammer (common to Spec. 14.1)
3. Gloves

2.8 Metalizing

The disks are rotated by a spinner and painted on upper surfaces by conductive silver paste with a writing brush. The firing of the paste is done at 800°C, 1 hour in the muffle furnace for the calcination. Then the opposite sides of the disks are also metalized.

Equipment and Materials to be used:

1. Spinner
2. Muffle furnace (common to the calcination)
3. Writing brush
4. Conductive silver paste

2.9 Soldering

Lead wires are soldered to both sides of the disks by a soldering iron.

Equipment and Materials to be used:

1. Soldering iron (common to Spec. 13.1)
2. Solder (common to Spec. 13.1)
3. Lead wire (common to Spec. 13.1)

2.10 Coating

The discs with lead wires are dipped in the coating material and dried on a hot plate.

Equipment and Materials to be used:

1. Hot plate
2. Coating material

2.11 Measuring

Various characteristics of the capacitors are measured. Capacitances and dissipation factors are measured by using an universal bridge. Insulation resistances and withstand voltages can be measured by super ohmmeter and a withstand voltage tester, respectively.

Equipment and Materials to be used:

1. Universal bridge
2. Super ohmmeter
3. Withstand voltage tester

2.12 Notes on Receptacles Cleaning and Samples Storage

Breakers and crucibles must be washed by cleanser and hydrochloric acid, respectively. Deionized water should be used for rinsing. Samples between processes should be stored in a vacuum desiccator.

Equipment and Materials to be used:

1. Deionized water supplier (common to Spec. 13.1)
2. Steel scrubbing brush
3. Cleanser
4. Hydrochloric acid
5. Beaker brush
6. Vacuum desiccator

Section 15. COMPUTOR

Spec. No.	SPECIFICATIONS
15.1.1	Mini-Computer NEAC-M4/f System
15.1.2	Data Terminal Equipment (Badminton Printer)

S-15

Spec. No. 15.1.1

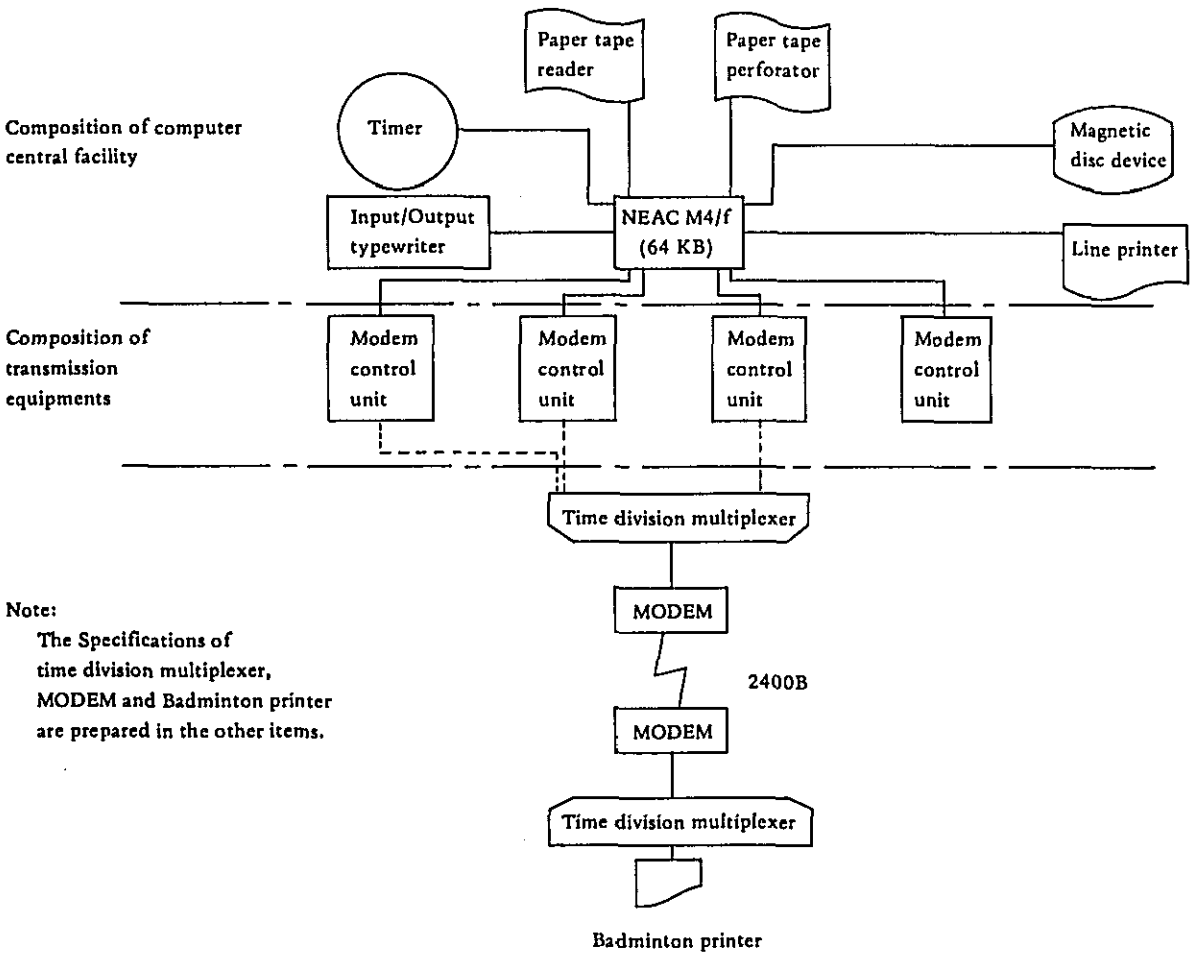
Mini-Computer NEAC-M4/f System

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: One (1) set

3. Standards: (Constructional Dimensions, Electrical Requirements, Necessary Mechanical Requirements, etc.)

   3.1 Diagram for System Composition



Note:
The Specifications of time division multiplexer, MODEM and Badminton printer are prepared in the other items.

Spec. No. 15.1.1

3.2 Table of Component Equipments

Item No.	Name	Specification	Q'ty	Unit	Remarks
1.	Basic processor unit	MB403	2	unit	M4/f main unit
2.	Memory module	MM409	4	unit	32 KB each
3.	DMA channel unit	MH4900-005	2	unit	
4.	Input/output typewriter	MD001f	2	unit	2,000 letters/min.
5.	Paper tape reader	MD110	1	unit	300 letters/min.
6.	Paper tape reader control section	ML4110	1	unit	
7.	Paper tape perforator	MD160	1	unit	50 letters/sec.
8.	Paper tape perforator control section	ML4160	1	unit	
9.	Line printer	MD350	2	unit	190 lines/min.
10.	Line printer control section	ML4350	2	unit	
11.	Magnetic disc device	MD470	2	unit	64 KB
12.	Magnetic disc device control section	MH4470f	2	unit	
13.	Control frame	MM420	2	unit	
14.	Power supply unit	MB438	2	unit	
15.	Rack	MM443	2	unit	5 shelves
16.	Extension chassis	MM412	1	unit	
17.	Automatic voltage regulator		1	unit	

Item No.	Name	Specification	Q'ty	Unit	Remarks
1.	MODEM, control unit	ML482C	2	unit	200B start-stop
		ML482E	1	unit	1,200B start-stop
		ML482F	1	unit	2,400B synchro-nous
2.	Control frame	MM420	4	unit	
3.	Power distribution board	MB438	1	unit	
4.	Standard rack	MM443	1	unit	5 shelves
5.	Extension chassis	MM412	1	unit	
6.	Interval timer	ML4910	2	unit	

Spec. No. 15.1.1

3.3 Standards

Function of Basic Processor Unit

Classification	Item		Performance
Main memory	Memory capacity		16 - 64 K words (RWM) 16 - 64 K words (ROM)
	Extension unit		16 K words (RWM) 16 K words (ROM)
	Word length		8 data bits + 1 parity bit
	Cycle time		0.8 μS
	Access time		0.35 μS
	Memory protect		Either 1 K words, 16 K words or 32 K words unit
	Mounting		Basic chassis used up to 64 K words (RWM) (ROM)
Operation unit	Circuit elements		LSI, MSI, SSI
	Arithmetic method		Parallel binary processing
	Range of word length		8 (1) - 32 bits (4 words)
	Number of instruction		67 type (Basic)
	Number of register		16 pcs., 2 groups
	Interruption level		11 lines external, 2 lines internal
	Addressing		Direct, indirect, relative, index
	Arithmetic speed (fixed point)	Addition and subtraction	1.6 μS (R-R) 2.4 μS (R-S)
		Multiplication	4.8 μS
		Division	8.0 μS
Input/output control unit	Standard input/output channel		Program control mode
	DMA channel (optional)		625 K words/s x 2 ports (= 1.25 M words)
	Simultaneous transfer capacity		8 bit, parallel
	Max. number of units		31 units
Others	Connectable standard equipping		Power source breakdown protector
			Memory parity checking
			Multiplication/division arithmetic mechanism

S-15

Spec. No. 15.1.1

Classification	Item		Performance
			Input/output typewriter control (for MD001f or MD005)
	Optional mechanism		MH4900-005 DMA channel mechanism
Requirements for installation	Environmental requirements		Temperature: 0 - 50°C Humidity: 0 - 90% Vibration: 0.5 G or less Impact: 5 G or less
	Input power source		AC 100 V ±10% 50/60 Hz ±1%
	Power consumption		250 VA
	External dimensions	Desk top	522 x 385 x 737 mm
		Rack mount	480 x 299 x 636 mm
	Weight		50 kg

Input/Output Equipments:

MD001f-001 Input/Output Typewriter

Printing unit:

Printing speed:	600 letters/min.
Printing font:	Type wheel
Character set:	64 letters
Max. number of printed letters in one line:	74 letters
Print spacing:	2.54 mm
Line spacing	4.23 mm
Printing paper width:	216 mm
Ink ribbon:	Black

Paper tape reader unit:

Reading speed:	600 letters/min.
Code:	8 units code

Paper tape perforater unit:

Perforation speed:	600 letters/min.

Spec. No. 15.1.1

Power source:	AC 100 V ±10 V, 50/60 Hz
Power consumption:	300 VA
Working temperature:	5°C - 35°C
External dimension:	550 mm(W), 910 mm(H), 470 mm(D)
Weight:	40 kg
Type:	Self supporting

MD350-001 Line Printer:

Printing speed:	190 lines/min. (2400B)
Printing time for one line:	256 mS (max.)
Time for feeding paper:	30 mS x N lines + 20 mS
Number of letters in one line:	132 letters/line
Character set:	128 letters (ISO)
Printing space:	2.54 mm
Line spacing:	4.23 mm
Printing paper:	Width; 177.8 mm - 406.4 mm (7 - 16 inches)
Number copyable:	3 sheets (incl. original)
Ink ribbon:	Wide ribbon 374 mm(W) x 88 m(L)
Paper feed control:	Controlled by 8 units paper tape or miler tape
Input power source:	AC 100 V ±10 V, 50/60 Hz
Power consumption:	560 VA
Working temperature:	5°C - 35°C
Working humidity:	40% - 80%
Noise level:	80 phon
External dimensions:	650 mm(W) x 1,170 mm(H) x 520 mm(D)
Weight:	150 kg
Type:	Self supporting

MD110 Paper Tape Reader:

Reading speed:	300 letters/sec.

Spec. No. 15.1.1

Tape speed:	30 inches/sec.
Reading method:	Photo-electric method
Reading tape:	8 units or 6 units
Power source:	AC 100 V ±10 V, 50/60 Hz
Power consumption:	130 VA
Working temperature:	0°C - 40°C
Working humidity:	30% - 90%
External dimensions:	480 mm(W) x 249 mm(H) x 210 mm(D)
Weight:	17.5 kg
Type:	Table-top rack-mount

MD460-001 Magnetic Disc Cartridge Device:

Capacity:	2,800 words (8 bits) (42 kW for spare)
Truck capacity:	7 K words
Rotation rate:	1,500 r.p.m. (50 Hz)
Average waiting time:	20.0 mS
Data transfer speed:	195 kW/sec.
Input power source:	AC 100 V ±10 V, 50/60 Hz
Power consumption:	200 VA
Working temperature:	15°C - 32°C
Working humidity:	20% - 80%
External dimensions:	483 mm(W), 175 mm(H), 582 mm(D)
Weight:	20 kg
Type:	Rack-mount

MD160 Paper Tape Perforator:

Perforating speed:	50 letters/sec.
Noise:	81 phon or less
Feeding speed:	5 inches/sec.
Kind of tape:	8 units or 6 units
Power source:	AC 100 V ±10 V, 50/60 Hz
Power consumption:	130 VA

Spec. No. 15.1.1

Working temperature:	0°C - 40°C
Working humidity:	30% - 90%
External dimensions:	480 mm(W) x 299 mm(H) x 300 mm(D)
Weight:	13 kg
Type:	Table top, rack-mount

ML 482C 200B MODEM Control Unit:

Number of circuits accommodated:	1 circuit
Transmission circuit:	Leased circuit General switched telephone circuit
Modulation rate:	200 bits/sec.
Communication method:	Full-duplex or semi-duplex
Synchronization:	Start-stop method
MODEM device:	DT-203 MODEM or N-200 MODEM
Type:	Module mount

ML 482E 1200B MODEM Control Unit:

Number of circuits accommodated:	1 circuit
Transmission circuit:	Leased circuit General switched telephone circuit
Modulation rate:	1,200 bits/sec.
Communication method:	Full-duplex or semi-duplex
Synchronization:	Start-Stop method
MODEM device:	DT-1203 MODEM or N-1200 MODEM
Type:	Module mount

ML 482F 2400B MODEM Control Unit:

Number of circuits accommodated:	1 circuit
Transmission circuit:	Leased circuit General switched telephone circuit
Modulation rate:	2,400 bits/sec.
Communication method:	Full-duplex or semi-duplex
Synchronization:	Synchronous method
MODEM device:	DT-2403 MODEM or N-2400 MODEM
Type:	Module mount

Spec. No. 15.1.1

3.4 Table of Factors

Model	Name	External dimensions (mm)			Weight	Power source frequency	Power source voltage	Current consumption	Thermal volume	Temperature	Humidity	Remarks
		W	D	H	(kg)	(Hz)	(V)	(A)	(kcal/H)	(°C)	(%)	
MB403	Basic processor	480	643.5	299	45	50/60+1	100±10	2.4 - 3.8	155 - 264	0 - 50	0 - 90	
MM412	Extension chassis	479.5	526.5	222	25	50/60+1	100±10	-5	430	0 - 50	0 - 90	
MM443	Standard rack	570	800	1,750	100	50/60+1	100±10	0.4	35	0 - 50	0 - 90	
MB438	Power supply unit	480	493	299	50	50/60+1	100±10	0.4	35	0 - 50	0 - 90	
MD005	Power supply unit	672	682	913	65	47 - 62	100±10	3.2	280	5 - 40	10 - 90	
MD110	Paper tape reader	480	300	249	20	50/60+1	100±10	1.3	110	0 - 40	30 - 90	
MD160	Paper tape perforator	480	300	299	13	50/60+1	100±10	1.3	110	0 - 40	30 - 90	
MD350	Line-printer	650	520	1,100	150	50/60+1	100±10	6	500	5 - 35	40 - 90	
MD470	Magnetic disc	483	582	175	20	50/60+1	100±10	2	180	5 - 40	40 - 90	
MM409	Memory module	1 sheet of S.PKG			1.6	D.C	+5V±0.25V -1.2V±1V +20V±0.2V	2.5 0.3 3.5	35	0 - 50	20 - 90	
MM420	Control frame	SI/O module			1.2	D.C	+5V +12V -12V	0.25 0.07 0.1	8	0 - 50	20 - 90	
ML4110	Paper tape reader controller	SI/O module 1/3			0.5	D.C	+5V +1.2V -1.2V	1.0 0 0	5	0 - 50	20 - 90	
ML4160	Paper tape perforator controller	SI/O module 1/3			0.5	D.C	+5V +1.2V -1.2V	1.0 0 0	5	0 - 50	20 - 90	
ML4350	Line printer controller	SI/O module 1/3			0.5	D.C	+5V +1.2V -1.2V	1.0 0 0	3	0 - 50	20 - 90	
MH4470f	Magnetic disc controller	SI/O module 3/3			3.5	D.C	+5V +12V -12V	3.3 0.13 0.15	17	0 - 50	20 - 90	
ML482 C,E	MODEM controller	SI/O module 1/3			0.5	D.C	+5V +12V -12V	1.2 0.07 0.07	7	0 - 50	20 - 90	
ML4910	Timer	SI/O module 1/3			0.5	D.C	+5V +12V -12V	0.8 0.05 0	4	0 - 50	20 - 90	
MH4910 -005	DMA channel	1 sheet of S. PKG			1.5	D.C	5V+0.5	1.2	13	0 - 50	20 - 90	

3.5 Software

The softwares shall be attached are as follows:

(1) *Basic software system*

Loader, assembler, utility program, I/O controller, arithmetic library etc.

(2) BOSY/disc operating system
Moniter program, general assembler, FORTRAN compiler, etc.
(3) Program library of scientific mathematics
(4) Disc sort program
(5) Message switching monitor system

3.6 Measuring Equipment

Digital memory scope	Iwatsu DSM-510
CRT	5 inches (130 mm)
Vertical deflection system:	
Input	1 channel
Sensitivity	10 mV/div – 5 V/div
Bandwidth	at REAL 4 Hz - 10 MHz
	at MEMORY 4 Hz - 250 kHz
Max. allowable input	300 V at direct
A/D converter:	
Resolution	8 bits of full-scale
Speed	1 μs/word
Horizontal deflection system:	
Sweep	triggerd, free-running, single
Sweep time	1 μs/div – 0.5 s/div
Sweep magnifier	x 10
Memory:	
Capacity	8 bits x 1,024 words
Write speed	0.1 ms/div – 0.5 s/div
Reed speed	Same as oscilloscopes write speed
Delay	Minus delay only 0, 2.5, 5, 7.5, 10 div
Power source	AC 220 V or 234 V ±10%, 50 Hz
Dimensions	approx. 228 mm(W), 264 mm(H), 420 mm(L)

Notes:

1. A name plate, on which name of item, date manufactured, serial number, name of manufacturer are described in Japanese, is to be attached to the panel or metal

Spec. No. 15.1.1

casing and cover. All other descriptions on the panel are to be in Japanese.

2. Painting color is to be of manufacturer's standard.
3. Manufacturer (Nominated): NIPPON ELECTRIC CO., LTD.
   Model NEAC-M4/f

4. Accessories and Spare Parts:
   Articles of consumption for two years

5. Materials to be submitted:
   Operational instruction manual (English) 5 copies, (Japanese) 3 copies, Test resulting sheet 3 copies, Catalogue 3 copies, Invoice and Packing list 4 copies each (one each of them is attached to equipment).

6. Aspect of Work:
   The manufacturer shall be responsible for the installation and the adjustment of these facilities.

7. Remarks:

S-15

Spec. No. 15.1.2

Data Terminal Equipment (Badminton Printer)

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: Two (2) units

3. Standards: (Constructional Dimensions, Electrical Requirements, Necessary Mechanical Requirements, etc.)

3.1 This equipment is to satisfy the following standards:

Printing speed:	Average 40 letters/sec.
Max. number of letter printed in one line:	132 columns
Character set:	128 letters
Number of keys and key board arrangement:	ISO standard key arrangement
Printing space:	2.54 mm (1/10 inches)
Line spacing:	4.23 mm (1/6 inches) or 8.46 mm (1/3 inches)
Printing paper (max. width):	406 mm (16 inches)
Printing method:	Standing printing method by "crown" type plastic wheel
Number of copies:	5 copies (incl. original)
Paper feed:	Tractor feed
Ink ribbon:	Red and black, switchable
Margin set:	Can be set at arbitrary position
Farmat control:	HT, VT, FF
Constructional dimensions:	
Printer unit;	225 mm(H), 600 mm(W), 455 mm(D)
Key board printer;	225 mm(H), 600 mm(W), 765 mm(D)
Weight: Printer unit;	20 kg

3.2 Power source, temperature, and humidity requirements:
AC 100 V ± 10 V, 50/60 Hz, Temperature; 5 - 35°C,
Humidity; 20 - 85% (40 - 70% for printing paper)

Spec. No. 15.1.2

Notes:

1. A name plate, on which name of item, date manufactured, serial number, name of manufacturer are described in English, is to be attached to the panel or metal casing and cover. All other descriptions on the panel are to be in English.
2. Painting color is to be manufacturer's standard.
3. Nominated Manufacturer: NIPPON ELECTRIC CO., LTD.
   Model NB3000

4. Materials to be submitted:
5. Materials to be submitted:
   Operational instruction manual (English) 5 copies, (Japanese) 3 copies, Test resulting sheet 3 copies, Catalogue 3 copies, Invoice and Packing list 4 copies each (one each of them is attached to equipment).

Section 16 WORKSHOP

Spec. No.	SPECIFICATION
16.1.1	Electroplating Installations
16.1.2	Chemicals for Electroplating
16.1.3	Miscellaneous Electroplating Implements
16.1.4	Draft Chamber
16.2.1	Press Brake
16.2.2	Universal Bender
16.3.1	AC Arc Welder
16.3.2	Welding Tools
16.3.3	Miscellaneous Welding Implements
16.3.4	Spot Welding Machine
16.4	Woodworking Tools
16.5.1	Vises and Clamps
16.5.2	Surface Ganges and Steel Compasses
16.5.3	Hammers
16.5.4	Punch Sets, Chisels and Marking Tools
16.5.5	Wrenches and Spanners
16.5.6	Screw Drivers and Screw Driver Sets
16.5.7	Nippers and Pliers
16.5.8	Scissors and Nail Pullers
16.5.9	Brushes
16.5.10	Box Block with V-groove
16.5.11	Universal Type Screen Projector
16.5.12	Air Compressor
16.5.13	Surface Plates
16.5.14	Micrometers
16.5.15	Vernier Calipers and Vernier Height Gauge
16.5.16	Dial Gauges and Stands
16.5.17	Squares and Straight-edges
16.5.18	Scales and Gauges
16.5.19	Implements for Measuring Work
16.5.20	Cutting Tools
16.5.21	Implements for Machining Work
16.5.22	Surface Roughness Tester

Spec. No.	SPECIFICATIONS
16.6	Engraving Machine
16.7.1	Precision Lathe
16.7.2	Precision Surface Grinder
16.7.3	Presses
16.7.4	Treadle Shearing Machine
16.7.5	Contour Machine
16.7.6	Drilling Machines
16.7.7	Universal Milling Machine
16.7.8	Electric Bench Grinder
16.8	Electric Furnace
16.9.1	Screws
16.9.2	Metalic Materials
16.9.3	Non-metalic Materials
16.9.4	Parts Cases
16.10	Carring Implements
16.11.1	Miscellaneous Tools
16.11.2	Hardness Tester

S-16

Spec. No. 16.1.1
Electroplating Installations

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 set

3. Specifications: (Constructional dimensions, electrical and mechanical requirements)
The electroplating installations shall be equipped with the vessels and equipment listed in the appendix sheet (provided separately) and shall be designed to be capable of plating with the use of Cu, Ni, Zn and Ag, as well as of chromate processing after Zn plating.
In addition to the above, the installation shall also be designed to proceed with small scale Au plating.

Notes:

1. The descriptions on the nameplate shall be in English, and the nameplate to be fitted on a metal case or cover shall include the name of article, manufacture date, manufacture number, and the name of maker.
   Other indications on the panel shall also be in English.
2. Painting color is to be of manufacturer's standard.
3. Unless otherwise designated in the specifications, the electroplating installations shall comply with the JIS Standards.
4. Designated Maker Tsurumi K.K.

4. Submittals:
The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment).

Spec. No. 16.1.1

Item No.	Name	Specification	Quantity	Remarks
1	Plating vessel (A)	Inside dimensions 300 mm x 300 mm x 400 mm (height) 2.3 mm thick; made of Fe; upper section L40 x 40 x 3 mm (t) reinforced The interior is lined with PVC to a thickness of 3 mm. Power supply 10 mmϕ x 450 mm Cu tube 3; power supply adapting parts provided 3 pairs, coated with PVC. Air agitator pipe provided.	2 units	For Cu and Ni platings
2	Plating vessel (B)	Inside dimensions 300 mm x 300 mm x 400 mm (height) Made of a 5 mm-thick tough plate. The upper section is reinforced, and the others are the same as those given for plating vessel (A).	2 units	For Zn and Ag platings
3	Hot-water degreasing vessel	Inside dimensions 300 mm x 200 mm x 400 mm (height) Made of a 1.5 mm thick SUS. The upper section is bent frame.	2 units	
4	Recovery and neutralizing vessel	Inside dimensions 300 mm x 200 mm x 400 mm (height) Made of a 5 mm thick tough plate The upper corners are reinforced.	7 units	2 units for recovery 2 units for neutralization 1 unit for pickling 1 unit for nitric acid 1 unit for chromate
5	Water-washing vessel (C)	Inside dimensions 400 mm x 200 mm x 400 mm (height). Made of a 5 mm-thick tough plate Divided into two parts with one partition. Overflow type.	3 units	Double-space type
6	Water-washing vessel (D)	Inside dimensions 450 mm x 200 mm x 400 mm (height). Made of a 5 mm thick tough plate. Divided into three parts with two partitions. Overflow type.	3 units	Triple-space type
7	DC rectifier	Input: 230V, single-phase Output: 0 – 10 A variable in this range	2 units	

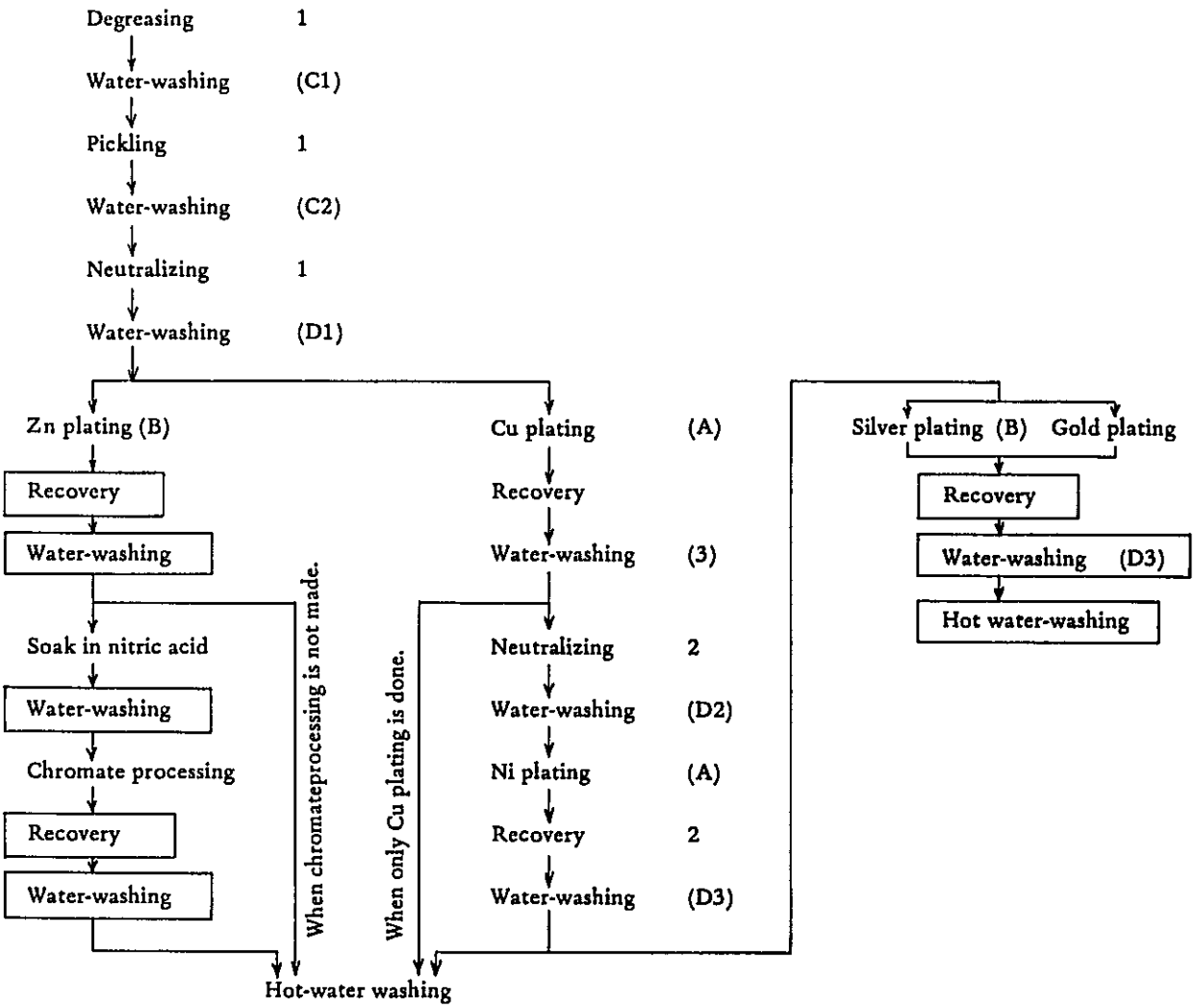
S-16

Spec. No. 16.1.1

Item No.	Name	Specification	Quantity	Remarks
		under the analog control system With an ammeter.		
8	DC rectifier	Input: 230V, single-phase Output: 0 – 30 A	1 unit	Triple-space type
9	Filter	KMF-12 type Single-phase, 100V, 40 W	4 units	For Cu, Ni, and Ag (Au) platings
10	Ion pure water making unit	MA-O type Single-phase, 100V	1 unit	
11	Heater	Single-phase, 100V, 500 W Teflon-coated	5 units	
12	Temperature regulator	Single-phase, 100V E-5 type	3 units	
13	Simplified Analyzing kit	(1) Copper cyanide plating solution analysis 1 unit (2) Zinc cyanide plating solution analysis 1 unit (3) Nickel plating solution analysis 1 unit (4) Silver cyanide plating solution analysis 1 unit Made by Yamamoto K.K. A reagent for the individual analyses shall be furnished.	1 set	
14	HULL CELL testing equipment	(1) HULL CELL testing water tank of the square type (2) Agitation air pump (3) Heater (100 W) (4) HULL CELL Table (5) Anode plate (Ni, Cu, and Zn) (6) Cathode plate (Bs) 65 mm x 100 mm	1 set	
15	Waste tank	Made of polyethylene DAILITE tank, 1,000 ℓ; with a cover	1	
16	Upper weighing plate type balance	Weighing range 0 – 1 kg Minimum sensible weight 0.5 g	1	

Spec. No. 16.1.1

Plating Process Flow Chart (relation between each plating tank and plating process)



Notes:

(1) The plating tanks marked ☐ are used initially for the Cu and Ni platings and are also employed for the other platings after being cleaned thoroughly.

(2) The gold plating will be conducted experimentally, using an enameled tank.

S-16

Spec. No. 16.1.2
Chemicals for Electroplating

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 set

3. Specifications: (Constructional dimensions, electrical and mechanical requirements)
   As per appendix sheet provided separately.

   Notes:
   1. The descriptions on the nameplate shall be in English, and the nameplate to be fitted on a metal case or cover shall include the name of article, manufacture date, manufacture number, and the name of maker.
      Other indications on the panel shall also be in English.
   2. Unless otherwise designated in the specifications, the chemicals (for electroplating) shall comply with the JIS Standards.
   3. Designated Maker Tsurumi K.K.

4. Accessories and Spares:

5. Submittals:
   The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

   (One copy shall be attached to each piece of equipment).

6. Remarks:
   An application manual prepared in English shall be provided, especially for the chromate solution and various lustering agents.

S-16

Spec. No. 16.1.2

Item No.	Name	Specification	Quantity	Remarks
1	Soda cyanide	NaCN; 1st class; contained in a 500 g bottle	40	
2	Cuprous cyanide	CuCN; 1st class; contained in a 500 g bottle	20	
3	Caustic soda	NaOH; 1st class; contained in a 500 g bottle	40	
4	Caustic potash	KOH; 1st class; contained in a 500 g bottle	20	
5	Nickel sulfate	$NiSO_4 6H_2O$; 1st class; contained in a 500 g bottle	60	
6	Nickel chloride	$NiCl_2 \cdot 6H_2O$; 1st class; contained in a 500 g bottle	20	
7	Rochell salt	$KNaC_4H_4O_6 \cdot 4H_2O$; 1st class; contained in a 500 g bottle	10	
8	Boric acid	H_2BO_3; 1st class; contained in a 500 g bottle	20	
9	Sulfuric acid	H_2SO_4; 1st class; contained in a 500 g bottle	10	
10	Hydrochloric acid	HCl; 1st class; contained in a 500 g bottle	10	
11	Nitric acid	HNO_3; 1st class; contained in a 500 g bottle	10	
12	Sodium carbonate	$Na_2CO_3 \cdot 10H_2O$; 1st class; contained in a 500 g bottle	8	
13	Chromate solution	For chromate processings after galvanizing	20 ℓ	
14	Silver cyanide	AgCN	500 gr	
15	Potassium auric cyanide	$K[Au(CN)_2] \cdot 2H_2O$	200 gr	

S-16

Spec. No. 16.1.2

Item No.	Name	Specification	Quantity	Remarks
16	Nickel plate lustering agent	UDYLITE #61	10 ℓ	
	Nickel plate lustering agent	UDYLITE #63	10 ℓ	
17	Cu plate lustering agent	C-BRIGHT #10	10 ℓ	
	Cu plate lustering agent	C-BRIGHT #30	10 ℓ	
18	Zinc plate lustering agent	SUPER #75	10 ℓ	
	Zinc plate lustering agent	ZB-57L	10 ℓ	
19	Copper plate	For plating anode; 75 mm x 200 mm	20 kg	
20	Nickel plate	For plating anode; 75 mm x 200 mm	20 kg	
21	Zinc plate	For plating anode; 75 mm x 200 mm	20 kg	
22	Carbon plate for silver	For plating anode; 75 mm x 200 mm	2 sheets	
23	Carbon plate for gold	For plating anode; 75 mm x 200 mm	2 sheets	

S-16

Spec. No. 16.1.3
Miscellaneous Electroplating Implements

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 set

3. Specifications: (Constructional dimensions, electrical and mechanical requirements)
   As per appendix sheet provided separately.

   Notes:
   1. The descriptions on the nameplate shall be in English, and the nameplate to be fitted on a metal case or cover shall include the name of article, manufacture date, manufacture number, and the name of maker.
      Other indications on the panel shall also be in English.
   2. Painting color is to be of manufacturer's standard.
   3. Unless otherwise designated in the specifications, the miscellaneous electroplating implements shall comply with the JIS Standards.
   4. Designated Maker Tsurumi K.K.

4. Accessories and Spares:

5. Submittales:
   The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificated		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

   (One copy shall be attached to each piece of equipment).

Spec. 16.1.3

Item No.	Name	Specification	Quantity	Remarks
1	Graduated cylinder	1,000 mℓ; 1 graduation: 10 mℓ	2	
	Graduated cylinder	500 mℓ; 1 graduation: 5 mℓ	2	
	Graduated cylinder	50 mℓ; 1 graduation: 2 mℓ	2	
2	TANK	Diameter of approx. 240 ϕ x height of approx. 240 mm Made of iron, enameled; with handle and a cover.	2	
3	Beaker	Made of polyethylene; 1,000 mℓ	10	
	Beaker	*Made of polyethylene; 500 mℓ*	*10*	
	Beaker	Made of glass; 300 mℓ	10	
4	Hand beaker	Made of polyethylene; 1,000 mℓ	10	
	Hand beaker	Made of polyethylene; 2,000 mℓ	5	
5	Glass rod	ϕ15 mm x 60 cm	5	
	Glass rod	ϕ5 mm x 30 cm	5	
6	Pipet	1) HALL pipet; 50 mℓ; 5 2) KOMAGOME pipet 20 mℓ 5 KOMAGOME pipet 10 mℓ 5 KOMAGOME pipet 5 mℓ 5	20 (in total)	
7	RUBBER BULBS	1) #2 type injector; red; 6 For large pipet 2) For 20 mℓ KOMAGOME pipet; 6 10 mℓ KOMAGOME pipet; 6 5 mℓ KOMAGOME pipet; 6	24 (in total)	
8	Wide Mouth type bottle	Made of polyethylene; 2,000 mℓ	6	
9	Funnel	Made of polypropylene; ϕ75 mm	5	
10	Pincette	Made of vinyl chloride; length, 50 cm *Colored pincette made of KF polymer;* 14.5 cm	2 *6*	
11	Spoon	Made of stainless steel; 3 in one set	2 sets	
12	Washing basket	Square type; coated with plastic; 20 cm x 20 cm x 20 cm	5	

S-16

Spec. 10.1.3

Item No.	Name	Specification	Quantity	Remarks
		Square type; coated with plastic; 15 cm x 15 cm x 15 cm	5	
13	Brush	1) Pipet brush 10 2) Bottle brush; No. 10; 10 3) Beaker brush; wooden grip; 10 4) Hand-washing brush; 5	35 (in total)	
14	Sponge scrubber	Sponge; for tile washing	10	
15	Gloves	Made of VINYLON	20 pairs	
16	Column type thermometer	0 – 150°C; red fluid contained; 30 cm long, Engraved stem.	5	
17	Soft copper wire Soft copper wire	ϕ1 mm x 50 m ϕ0.6 mm x 50 m	1 coil 1 coil	
18	Dry-wet type thermometer	Wall-mount type with a water bottle	2	

S-16

Spec. No. 16.1.4
Draft Chamber

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 unit

3. Specifications: (Constructional dimensions, electrical and mechanical requirements)
KDS-120 type
1,200 mm(L) x 750 mm(W) x 2,350 mm(H)
The draft chamber will not have the air blower installed; therefore, the upper air outlet is of the same design as that of standard model.
The chamber is made of steel and is coated with a chemical resistant material for its finish.
One water cock, one gas cock, and one power outlet (withstand voltage of more than 500V) are furnished.

Notes:

1. The descriptions on the nameplate shall be in English, and the nameplate to be fitted on a metal case or cover shall include the name of article manufacture date, manufacture number, and the name of maker. Other indications on the panel shall also be in English.
2. Painting color is to be of manufacturer's standard.
3. Unless otherwise designated in the specifications, the draft chamber shall comply with the JIS Standards.
4. Designated Maker Yamato Kagaku K.K.

4. Submittals:
The following shall be submitted in the number of copies specified below.

Instruction Manual	(English)	(5 copies)
Instruction Manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment).

S-16

Spec. No. 16.2.1
Press Brake

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 unit

3. Specification (Construction dimensions, electrical requirement and mechanical requirements, etc.)

Type	RG-50	
	Tonnage	50
	Max. bending length	2,000 mm
	Max. bending thickness	3.2 mm
	Distance between uprights	1,520 mm
	Throat depth	400 mm
	Length of stroke	100 mm
	Overall	(L)2,000 mm x (W)1,410 mm x (H)1,845 mm
	Motor	5.5 kW 400V 3ϕ
	Net weight	2.9 ton
Accessaries	Punch No. 45 SKT-4 0.2 R	1 pc.
	Dice No. 126 SCM-4	1
	Punch No. 4 SCM-4 0.2 R	2 pcs.
	Dice No. 123 SCM-4	2
	Working oil	80 ℓ

Note:

1. A name plate, on which name of item, date manufactured, serial number and name of manufacturing company are described in English, is attached to pannel, metal casing or cover.
   All the other descriptions on pannel are to be described in English.
2. Anything but the specified in this specification is to be subject to JIS.
3. Manufacturer Nominated: Amada K.K.

Spec. No. 16.2.1

4. Accessaries and Spare Parts:
   As listed on the above.

5. Materials to be submitted:

Operational instruction manual	(English)	(5 copies)
Operational instruction manual	(Japanese)	(3 copies)
Test resulting sheet		(3 copies)
Catalogue		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One each of them is attached to the equipment).

S-16

Spec. No. 16.2.2
Universal Bender

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 unit

3. Specifications: (Constructional dimensions, electrical and mechanical requirements)
Type: No. 1 type
Specifications: HOSSHELD bender
Manually-operated type with the use of the following attachments given below, the universal type bender is capable of bending.
(1) 22 mm round bar or square bar,
(2) plate measuring 76.2 mm x 11.1 mm, and
(3) 31.7 mmϕ pipe.
Attachments
(1) Pipe bending jig
(2) I-bolt S-bending jig
(3) Angle offset bending jig
(4) V-bending jig
(5) Square bar bending jig
(6) Ring coil bending jig
(7) Sharp-angle bending jig
(8) Ornamental iron work bending jig

Notes:
1 The descriptions on the nameplate shall be in English, and the nameplate to be fitted on a metal case or cover shall include the name of article, manufacture date, manufacture number, and the name of maker.
Other indications on the panel shall also be in English.
2. Painting color is to be of manufacturer's standard.
3. Unless otherwise designated in the specifications, the universal bender shall comply with the JIS Standards.
4. Designated Maker Shinchi Shoten (Tosa Boeki)

Spec. No. 16.2.2

4. Accessories and Spares:
   A set of standard accessories, such as spanner, etc.

5. Submittals:
   The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment).

Spec. No. 16.3.1
Arc Welder

1. *Purpose of Application:*
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 unit

3. Specifications: (Constructional dimensions, electrical and mechnical requirements)

Type:	AT-SS4 type	
Specifications:	Rated current	300 A
	Primary voltage	230V (50 Hz, single-phase)
	Primary input	Approx. 23.5 kVA
	Range of current	55 – 305A
	Rated load voltage	35V (resistor)
	Dimensions	425 mm(W) x 540 mm(L) x 645 mm(H)
	Weight	Approx. 101 kg

Notes:

1. The descriptions on the nameplate shall be in English, and the nameplate to be fitted on a metal case or cover shall include the name of article, manufacture data, manufacture number, and the name of maker. Other indications on the panel shall also be in English.
2. Painting color is to be of manufacturer's standard.
3. Unless otherwise designated, the AC are welder shall comply with JIS C 9301.
4. Designated Maker Shinchi Shoten

4. Accessories and Spares:
   A set of power cords (including the plugs, etc.)

5. Submittals:
   The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)

Catalog	(3 copies)
Invoice	(4 copies)
Packing list	(4 copies)

(One copy shall be attached to each piece of equipment).

S-16

Spec. No. 16.3.2
Welding Tools

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 unit

3. Specifications: (Constructional dimensions, electrical and mechanical requirements)

Items	Specifications	Quantity	Remarks
(1) Welding rod holder	For the 300 A welding rod; with 1.5 m cord	2	For AT-SS4 type
(2) Welding cable	2 pc; 60 mm^2; 5 m; a terminal is provided at both ends.	2	For AT-SS4 type
(3) Grounding clip	For 300 A; 1.5 m cord	2	For AT-SS4 type
(4) Welding mask	For protection; with a colored glass and hand holding grip	2	
(5) Welding safety helmet	Helmet with a colored glass	1	
(6) Leather gloves	Made of authentic leather; applied at the time of welding	6 pairs	
(7) I-anvile	200 mm long; railway type cross section	2	
(8) Arc welding rod	ϕ2.6 mm x approx. 30 cm	30 kg	
Arc welding rod	ϕ4 mm x approx. 30 cm	30 kg	

S-16

Spec. No. 16.3.2

Item	Specifications	Quantity	Remarks
(9) Disc grinder	PDP-100B type; 100 mmϕ; single phase, 230V	1 unit	
Accessories	(1) Wheel 100 mmϕ (outside dia.) x 6 mm(t) x 15 mmϕ hole	40	
	(2) Cup type wire brush (75 mmϕ M10)	20	
	(3) A set of standard accessories, such as the connecting cord, etc.	1	

Notes:

1. The descriptions on the nameplate shall be in English, and the nameplate to be fitted on a metal case or cover shall include the name of article, manufacture data, manufacture number, and the name of maker. Other indications on the panel shall also be in English.
2. Painting color is to be of manufacturer's standard.
3. Unless otherwise designated in the specifications, the welding tools shall comply with the JIS standards.
4. Designated Maker Shinchi Shoten K.K.

4. Accessories and Spares

The accessories and spares shall be entered in the space of the specifications.

5. Submittals:

The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificated		(3 copies)
Catalog		(3 copies)

Invoice	(4 copies)
Packing list	(4 copies)

(One copy shall be attached to each piece of equipment).

S-16

Spec. No. 16.3.3
Misellaneous Welding Implements

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 unit

3. Specifications: (Constructional dimensions, electrical and mechanical requirements)
   As per appendix sheet provided separately.

   Notes:
   1. The descriptions on the nameplate shall be in English, and the nameplate to be fitted on a metal case or cover shall include the name of article, manufacture date, manufacture number, and the name of maker.
      Other indications on the panel shall also be in English.
   2. Painting color is to be of manufacturer's standard.
   3. Unless otherwise designated in the specifications, the miscellaneous welding implements shall comply with the JIS Standards.
   4. Designated Maker Shinchi Shoten K.K.

4. Submittals:
   The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

   (One copy shall be attached to each piece of equipment).

S-16

Spec. No. 16.3.3

Item No.	Name	Specification	Quantity	Remarks
1	Silver brazing filler metal solder	SG146, ϕ1.6 mm	3 kg	
2	Flux for brazing	SG flux; 500 gr/can	2 cans	
3	Aluminum solder	AM050	3 kg	
4	Solder	Paste contained; Slender type solder ϕ2 mm 50%	10 rolls	1 kg/roll
5	Bar solder	Special No. 1	8 kg	
6	Paste	For soldering; 50 g/can	20 cans	
7	Soldering iron Soldering iron	Ax type; 300 g; with a grip Spear type; 30 g; with a grip	2 2	
8	Electric soldering iron Electric soldering iron Electric soldering iron	Popular type; 60 W; square type I type; 150 W 1 type; 300 W	5 2 -1	
9	Hand burner	For city gas	1	
10	KINOSHITA blue hand burner	For city gas, table set type	1	

S-16

Spec. No. 16.3.4
Spot Welding Machine

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 set

3. Specification (Construction dimensions, electrical requirement and mechanical requirements, etc.)

Type:	24 kVA SP-AG		
	Power source	230V, 1ϕ	
	Max. short circuit current	12,000 A	
	Standard throat size	Depth 600 mm	
		Horn spacing 200 mm	
	Max, welding press	450 kg	
	Air pressure	5 kg/cm^2	
	Welding ability (standard)	4.5 mmt, (at Mild steel up set 2 sheets)	
	Overall dimension	460 mm(W) x 1,190 mm(L) x 1,540 mm(H)	
	Weight	300 kg	
Accessaries	(1) Timer SA-3A type		
	Power source	230V, 1ϕ	
	Main circuit switching system	Thyristor	
	Control system	Semi-synchronous	
	Operation cycle ajustment	Squeezing, holding, release;	3 cycle – 1 sec.
		Current feed;	2 cycle – 2 sec.
	(2) Rubber hose	3/8 x 5 m (for compress air)	
	(3) Rubber hose	5/8 x 20 m (for cooling water)	

Notes:

1. A name plate, on which name of item, date manufactured, serial number and name of manufacturing company are described in English, is attached to pannel, metal casing or cover.
   All the other descriptions on pannel are to be described in English.
2. Anything but the specified in this specification is to be subject to JIS.

3. Manufacturer Nominated: HITACHI

4. Accessaries and Spare Parts:
As listed on the above.

5. Materials to be submitted:

Operational instruction manual	(English)	(5 copies)
Operational instruction manual	(Japanese)	(3 copies)
Test resulting sheet		(3 copies)
Catalogue		(3 copies)
Invoice		(4 copies)
Packing List		(4 copies)

(One each of them is attached to the equipment).

S-16

Spec. No. 16.4
Woodworking Tools

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 unit

3. Specifications: (Constructional dimensions, electrical and mechanical requirements)

Items	Specification	Quantity
1. Hand drill	Nominal size of 7 mm; max. drill dia. of 7 mmϕ; JIS B 4611	1 unit
2. Ratchet brace	Popular type complying with JIS B 4649	1 unit
3. Ball type drill	19 mmϕ x 110 mm (L)	2
	25 mmϕ x 110 mm(L)	2
4. Flat type auger bit	Twist furnished; ϕ10 mm	1
	Twist furnished; ϕ12 mm	1
	Twist furnished; ϕ15 mm	1
	Twist furnished; ϕ18 mm	1
	Twist furnished; ϕ24 mm	1
	Twist furnished; ϕ27 mm	1
5. Bits auger	ϕ6 mm	2
	ϕ8 mm	2
6. Machine auger	ϕ9 mm	2
Machine auger	ϕ12 mm	2
Machine auger	ϕ15 mm	1
Machine auger	ϕ18 mm	1
Machine auger	ϕ21 mm	1

Spec. 16.4

	Items	Specification		Quantity
	Machine auger		ϕ24 mm	1
	Machine auger		ϕ30 mm	1
7.	Square drill		9.5 mm	1
	Square drill		12.7 mm	1
	Square drill		14.0 mm	1
	Square drill		16.5 mm	1
	Square drill		21.0 mm	1
	Square drill		24.0 mm	1
8.	3-fluted drill	Overall length	20 cm	1
9.	4-fluted drill	Overall length	15 cm	1
10.	Fret saw blade arc holder	Universal type Capable depth	 120 mm	2
11.	Fret saw blade	#4 for woodworking		2 gross
	Fret saw blade	#5 flor woodworking		2 gross
	Fret saw blade	#000 for metal working		2 gross
	Fret saw blade	#2 for metal working		2 gross
12.	Woodworking double-blade saw	Nominal size	270 mm	2
13.	Woodworking planner	Blade length of approx. 65 mm for rough finish		1
	Woodworking planner	Blade length of approx. 65 mm for fine finish		1
14.	Ratchet chisel	Blade width of	6 mm	1
	Ratchet chisel	Blade width of	10 mm	1
	Ratchet chisel	Blade width of	15 mm	1

Spec. No. 16.4
Woodworking Tools

Items	Specification	Quantity
15. Bent scale	For woodworking; made of stainless steel L501	2
16. Whetstone	For finish grinding; width of 65 mm; length of 230 mm	1
17. Motor-driven planer	Model 1804A; 100V 3 planer blades referred to above are furnished.	1
18. Motor-driven circular saw	Model 5900; 100V Three, 235 mmϕ circular saw blades for woodworking are furnished. Two, 235 mmϕ chip saw blades for woodworking are furnished. The bench stand is also furnished.	1 set
19. Jig. saw	Model 4300A; 100V Accessory saws Change saw blade with a length of 64 mm for woodworking 30 Change saw blade with a length of 41 mm for metal working 30	1 unit
20. Rooter	Model 3600B; 100V Accessory bits Straight bit (8 mmϕ x 18 mm) 10 Straight bit (12 mmϕ x 30 mm) 5 Sash bit 6.5 5 Horizontal groove type bit 6 mm Round type bit R 6 mm 5	1 unit
21. Motor-driven drill	Model 6100B; 100V 6.5 mmϕ; 2,500 rpm; 1 kg	1 unit

Spec. No. 16.4

Items	Specification		Quantity
	Accessory drills		
	12.7 mm woodworking drill; with 6.4 mmϕ stepped shank	3	
	6.4 mmϕ woodworking drill and straight bit	5	
Motor driven drill	Model 6400; 100V		1 set
	10 mmϕ, 1,700 rpm, 2.3 kg		
	Accessories		
	Carbon brush	4	
	Square chisel stand	1	

Notes:

1. The descriptions on the nameplate shall be in English, and the nameplate to be fitted on a metal case or cover shall include the name of article, manufacture date, manufacture number, and the name of maker.
   Other indications on the panel shall also be in English.
2. Painting color is to be of manufacturer's standard.
3. Unless otherwise designated in the specifications, the woodworking tools shall comply with the JIS Standards.
4. Designated Maker Shinchi Shoten K.K.

4. Submittals:

The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment).

Spec. No. 16.4

5. Remarks:
The drills, augers and other bits shall be encased according to their application category, and their names and diameters shall be shown on theses.
Shall be entered in English.

Spec. No. 16.5.1
Vises and Clamps

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 set

3. Specifications: (Constructional dimensions, electrical and mechanical requirements)

	Items	Dia.	Span	Clamping depth	Quantity	Remarks
1)	Lead type horizontal vise with a turning block	110 mm	180 mm	75 mm	1	
2)	Horizontal type vise	150 mm	150 mm	133 mm	1	Popular type (applied at the time of welding)
3)	Table-set small-sized vise	50 mm	35 mm		1	JIS B 4616 (GP type)
4)	Vise for drilling machine	65 mm	50 mm		1	Double-direction
		75 mm	60 mm		1	open type
5)	Vise for intermediate sized drilling machine	100 mm	95 mm		1	
		125 mm	105 mm		1	
		150 mm	120 mm		1	
		Jaw width	Jaw span	Jaw depth		
6)	Woodworking vise	180 mm	185 mm	75 mm	1	To be set in the woodworking room
		Dia.	Overall length			
7)	Handy type vise	25 mm	100 mm		2	Popular type
		Frame thickness	Jaw depth			
8)	Squill vise	16 mm	75 mm		2 units	C type
		20 mm	100 mm		2 units	C type
		22 mm	148 mm		2 units	C type
		29 mm	165 mm		2 units	C type

Spec. No. 16.5.1

Items	Jaw length	Jaw span	Quantity	Remarks
9) Parallel clamp	50 mm	30 mm	2	A type
	80 mm	60 mm	2	C type
	150 mm	100 mm	4	F type
	Type No.	Applicable diameters		
10) Pin vise	#5	ϕ1.3 mm — ϕ2.2 mm	2	Double head type Nickel plated
	#6	ϕ2.3 mm — ϕ3.2 mm	2	Double head type Nickel plated
	#7	ϕ3.3 mm — ϕ4.2 mm	2	Double head type Nickel plated
	#8	ϕ4.3 mm — ϕ5.2 mm	2	Double head type Nickel plated

Notes:

1. The descriptions on the nameplate shall be in English, and the nameplate to be fitted on a metal case or cover shall include the name of article, manufacture date, manufacture number, and the name of maker. Other indications on the panel also be in English.
2. Painting color is to be of manufacturer's standard.
3. Unless otherwise designated in the specifications, the vises and clamps shall comply with the JIS Standards.
4. Designated Maker Shinchi Shoten K.K.

4. Submittals:

The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment).

S-16

Spec. No. 16.5.2
Surface Gauges and Steel Compasses

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 set

3. Specifications: (Constructional dimensions, electrical and mechanical requirements)

	Items	Specification		Quantity
1)	Surface gauge	Height 200 mm, Dimensions of the square block 70 x 45 x 25 (mm)		1
	Surface gauge	Height 150 mm, Dimensions of the square block 65 x 40 x 22 (mm)		1
2)	Compass	Overall length	100 mm	2
		Overall length	150 mm	1
		Overall length	200 mm	1

Notes:

1. The descriptions on the nameplate shall be in English, and the nameplate to be fitted on a metal case or cover shall include the name of article, manufacture date, manufacture number, and the name of maker.
   Other indications on the panel shall also be in English.
2. Painting color is to be of manufacturer's standard.
3. Unless otherwise designated in the specifications, the surface gauges and steel compasses shall comply with the JIS Standards.
4. Designated Maker Shinchi Shoten K.K.

4. Submittals:
   The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)

Test certificate	(3 copies)
Catalog	(3 copies)
Invoice	(4 copies)
Packing list	(4 copies)

(One copy shall be attached to each piece of equipment).

Spec. No. 16.5.3

Hammers

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 set

3. Specifications: (Constructional dimensions, electrical and mechanical requirements)

Items	Specification	Quantity	Remarks
1) Iron working hammer	Double-head type; with a grip; 2.2 kg	1	JIS A8903
2) Single-hand hammer	Nominal size 1/4; 110 gr	4	With a grip
Single-hand hammer	Nominal size 1/2;225 gr	4	With a grip
Single-hand hammer	Nominal size 3/4;330 gr	3	With a grip
Single-hand hammer	Nominal size 1;450 gr	2	With a grip
3) Joiner hammer	Nominal size 1/2;225 gr	2	With a grip
4) Plastic hammer	0.2 kg core made of light alloy; head dia. 35 mm	3	
	0.1 kg core made of light alloy; head dia. 25 mm	2	
	0.5 kg iron core; head dia. 35 mm	1	
5) "KAZARIYA" hammer	With a grip; head dia. 24 mm For Bumping	2	
6) Levelling hammer	With a grip; double-round head, head dia. 30 mm For Bumping	2	
7) Wooden hammer	Length 120 mm, head dia. 45 mm	5	

Spec. No. 16.5.3

Notes:

1. The descriptions on the nameplate shall be in English, and the nameplate to be fitted on a metal case or cover shall include the name of article, manufacture date, manufacture number, and the name of maker. Other indications on the panel shall also be in English.
2. Painting color is to be of manufacturer's standard.
3. Unless otherwise designated in the specifications, the hammers shall comply with the JIS Standards.
4. Designated Maker Shinchi Shoten K.K.

4. *Submittals:*

The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment).

S-16

Spec. No. 16.5.4

Punch Set, Chisels and Marking Tools

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 set

3. Specifications: (Constructional dimensions, electrical and mechanical requirements)

Items	Specification	Quantity
1. Pin punch set	Tip dia. 2.5, 3, 4, 5, 5.5, 6.5, 8, 10 mmϕ 8 in one set	1 set
2. Center punch set	Large one (Length of 150 mm), middle one (125 mm), and small one (100 mm); 12 in one set	1 set
3. Flat chisel	Chisel tip 13 mm x 13 mm; length 160 mm, octagonal	5
Flat chisel	Chisel tip 19 mm x 16 mm; length 190 mm, octagonal	5
Flat chisel	Chisel tip 25 mm x 22 mm, length 215 mm, octagonal	3
4. Concrete demolishing chisel	Dia. 25 mm; length 270 mm	5
5. English letter marking set	Height 3 mm	1 set
6. Figure marking	Height 3 mm	1 set

Notes:

1. The descriptions on the nameplate shall be in English, and the nameplate to be

fitted on a metal case or cover shall include the name of article, manufacture date, manufacture number, and the name of maker. Other indications on the panel shall also be in English.

2. Painting color is to be of manufacturer's standard.
3. Unless otherwise designated in the specifications, the punch set, chisels, and marking tools shall comply with the JIS Standards.
4. Designated Maker Shinchi Shoten K.K.

4. Submittals:

The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment).

S-16

Spec. No. 16.5.5
Wrenches and Spanners

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.
2. Quantity: 1 set

3. Specifications: (Constructional dimensions, electrical and mechanical requirements)
   As per appendix sheet provided separately.

   Notes:
   1. The descriptions on the nameplate shall be in English, and the nameplate to be fitted on a metal case or cover shall include the name of article, manufacture date, manufacture number, and the name of maker. Other indications on the panel shall also be in English.
   2. Painting color is to be of manufacturer's standard.
   3. Unless otherwise designated in the specifications, the wrenches and spanners shall comply with the JIS Standards.
   4. Designated Maker Shinchi Shoten K.K.

4. Submittals:
   The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

   (One copy shall be attached to each piece of equipment).

S-16

Spec. No. 16.5.5

Item No.	Names	Specifications		Quantity	Remarks
1	Adjustable angle wrench	Length 100 mm; max. jaw span	13 mm	6	JIS B4604
	Adjustable angle wrench	Length 200 mm; max. jaw span	24 mm	5	JIS B4604
	Adjustable angle wrench	Length 300 mm; max. jaw span	34 mm	3	JIS B4604
2	Motor wrench	Length 230 mm, max. jaw span	75 mm	1	
3	Socket wrench set	Length 12.7 mm; 24 in one set		1 set	No. 424
		Socket sizes 7/16", (12 different sizes)	1"		
		Socket sizes 10 mm, (12 different sizes)	26 mm		
4	Pipe wrench	Length 250 mm; range of applicable diameters 6 — 25 mmϕ		1	
	Pipe wrench	Length 450 mm; range of applicable diameters 13 — 52 mmϕ		1	
5	T-type wrench	Dia. 10 mm; overall length	150 mm	1	
	T-type wrench	Dia. 12 mm; overall length	160 mm	1	
	T-type wrench	Dia. 13 mm; overall length	160 mm	1	
	T-type wrench	Dia. 14 mm; overall length	160 mm	1	
	T-type wrench	Dia. 17 mm; overall length	180 mm	1	
	T-type wrench	Dia. 19 mm; overall length	200 mm	1	
	T-type wrench	Dia. 21 mm; overall length	210 mm	1	
	T-type wrench	Dia. 23 mm; overall length	220 mm	1	
6	6 spanner set	Double-ended A type; 8 x 9, . . . 21 x 23, 6 in one set		1 set	refer to JIS B 4630 appendix. sheet
		Double-ended B type; 5/16 x 11/32, . . . 25/32 x 7/8, 6 in one set		1 set	refer to JIS B 4630 appendix. sheet
7	Set hexagon bar wrenches	1.4, 2, . . . 5, 6 (mm); 7 in one set		2 sets	507 type
	Set hexagon bar wrenches	1/16, 5/64, . . . 5/16, 3/8 (inch); 12 in one set		1 set	U12 type
8	Hexagon bar wrench	Nominal dia. 8 mm x length	100 mm	1	
	Hexagon bar wrench	Nominal dia. 10 mm x length	112 mm	1	

S-16

Spec. No. 16.5.5

Item No.	Names	Specifications	Quantity	Remarks
	Hexagon bar wrench	Nominal dia. 12 mm x length 125 mm	1	
	Hexagon bar wrench	Nominal dia. 14 mm x length 140 mm	1	
9	Hook spanner wrench	Nominal size 12/14, 16/20 25/38, 30/32 34/38, 40/42	6 (in total) One each	

S-16

Spec. No. 16.5.6

Screw Drivers and Screw Driver Sets

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 set

3. Specifications: (Constructional dimensions, electrical and mechanical requirements)
   As per appendix sheet provided separately.

   Notes:
   1. The descriptions on the nameplate shall be in English, and the nameplate to be fitted on a metal case or cover shall include the name of article, manufacture date, manufacture number, and the name of maker. Other indications on the panel shall also be in English.
   2. Painting color is to be of manufacturer's standard.
   3. Unless otherwise designated in the specifications, the screw drivers and screw driver sets shall comply with the JIS Standards.
   4. Designated Maker Shinchi Choten K.K.

4. Submittals:
   The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

   (One copy shall be attached to each piece of equipment).

S-16

Spec. No. 16.5.6

Item No.	Name	Specification	Quantity	Remarks
1	Precision screw driver set	6 in one set; regular type; nickel-plated	3 sets	Contained in a plastic case
		6 in one set; Phillips type, nickel-plated	3 sets	With a vinyl cover
2	Insulated screw driver with a plastic grip	Driver shaft length 50 mm; width 4.5 mm x thickness 0.6 mm	4	JIS B4609
	Insulated screw driver with a plastic grip	Driver shaft length 75 mm; width 5.5 mm x thickness 0.7 mm	4	
	Insulated screw driver with a plastic grip	Driver shaft length 100 mm; width 6.0 mm x thickness 0.8 mm	4	
	Insulated screw driver with a plastic grip	Driver shaft length 125 mm; width 7.0 mm x thickness 0.9 mm	4	
	Insulated screw driver with a plastic grip	Driver shaft length 150 mm; width 8.0 mm x thickness 1.0 mm	4	
	Insulated screw driver with a plastic grip	Driver shaft length 200 mm width 9.0 mm x thickness 1.1 mm	4	
	Insulated screw driver with a plastic grip	Driver shaft length 250 mm; width 10 mm x thickness 1.2 mm	2	
3	Phillips head insuladed screw driver with a plastic grip	Screw shaft length 75 mm; shaft dia. 5 mm	4	Nominal size No. 1 JIS B4633
	Phillips head insuladed screw driver with a plastic grip	Screw shaft length 100 mm; shaft dia. 6 mm	4	Nominal size No. 2
	Phillips head insuladed screw driver with a plastic grip	Screw shaft length 150 mm shaft dia. 8 mm	4	Nominal size No. 3
	Phillips head insuladed screw driver with a plastic grip	Screw shaft length 200 mm; shaft dia. 9 mm	4	Nominal size No. 4

		Opposit side distance	Shaft length	Shaft head dia.		
4	Box type screw driver	9 mm	125 mm	12.7 mm	1	} Diameter of applicable bolt 6 mm
	Box type screw driver	10 mm	125 mm	14.3 mm	1	
	Box type screw driver	13 mm	150 mm	19.0 mm	1	} Diameter of applicable bolt 8 mm
	Box type screw driver	14 mm	150 mm	19.0 mm	1	
	Box type screw driver	17 mm	150 mm	23.0 mm	1	Diameter of applicable bolt 10 mm

S-16

Spec. No. 16.5.7
Nippers and Pliers

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity 1 set

3. Specifications: (Constructional dimensions, electrical and mechanical requirements)

Item	Specification	Quantity	Remarks
1. Side cutting pliers	Nominal size 125 mm	3	Complying with JIS B4623
Side cutting pliers	Nominal size 175 mm	3	JIS B4623
2. Electrician's pliers	Length 160 mm; tip width 3 mm	3	JIS B4631
3. Thin nose read cutter pliers	Flat bit; nominal size 125 mm	1	
4. Round nose pliers	Nominal size 150 mm	2	
5. Diagonal cutting nipper	Nominal size 125 mm	2	JIS B4625
	Nominal size 150 mm	2	JIS B4625
6. Diagonal, cutting nipper	Nominal size 150 mm, powerful type	2	JIS B4635
7. Combination stripping nipper	Overall length 125 mm	1	
	Overall length 150 mm	1	
8. Cable cutter	Nominal No. 2; overall length 760 mm	1	

S-16

Spec. No. 16.5.7

	Items	Specification	Quantity	Remarks
9.	Cutting nipper	150 mm	2	
10.	MIGET cutter	Overall length 200 mm	1	
11.	Combination pliers	Nominal size 150 mm	2	JIS B4614
	Combination pliers	Nominal size 200 mm	2	JIS B4614
12.	Universal plier	Overall length 160 mm	1	
13.	Long nose plier	Overall length 165 mm	1	
14.	Pliers	Flat tong 150 mm	3	
	Pliers	Round tong 150 mm	3	
15.	Long nose pliers	Round tong 180 mm	2	
	(Japan type)	Round tong 210 mm	2	
16.	Tongs for forging work	Flat bill type; overall length 300 mm	2	

S-16

Spec. No. 16.5.8
Scissors and Nail Pullers

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 set

3. Specifications: (Constructional dimensions electrical and mechanical requirements)

Items	Specification		Quantity
1. Tinners scissors	Straight edge; overall length	210 mm	2
Tinners scissors	Straight edge; overall length	270 mm	1
Tinners scissors	Curved narrow edge; overall length	210 mm	2
Tinners scissors	Curved narrow edge; overall length	270 mm	1
2. Woolen-cloth scissors	Overall length	220 mm	2
3. Claw-bar and nail puller	Overall length	300 mm	2
4. Claw-bar	Overall length	540 mm	1
5. Nail puller	Overall length Sure-grip type	460 mm	1

Notes:

1. The descriptions on the nameplate shall be in English, and the nameplate to be fitted on a metal case or cover shall include the name of article, manufacture date, manufacture number, and the name of maker. Other indications on the panel shall also be in English.
2. Painting color is to be of manufacturer's standard.
3. Unless otherwise designated in the specifications, the scissors and nail pullers shall comply with the JIS Standards.
4. Designated Maker Shinchi Shoten K.K.

Spec. No. 16.5.9

4. Submittals;

The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment)

S-16

Spec. No. 16.5.9
Prushes

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 set

3. Specifications: (Constructional dimensions, electrical and mechanical requirements)

Items	Specification	Quantity
1. Wire brush	Made of iron wires; narrow type; 3-line wire bundle arrangement	5
	Made of brass; narrow type; 3-line wire bundle arrangement	5
	Saber type; 2-line wire bundle arrangement; made of brass	5
	Oval type; made of iron wires	2
2. Special broom	Made of fern (KŌJIN broom)	10
3. Oil brush	Middle-size	10
4. Bamboo brush	Straight type	30
5. Tube brush	125 mm	10
6. Paint brush	For varnishing; 0.99 cm	5
Paint brush	For varnishing; 1.65 cm	5

Notes:

1. The descriptions on the nameplate shall be in English, and the nameplate to be fitted on a metal case or cover shall include the name of article, manufacture date, manufacture number, and the name of maker. Other indications on the panel shall also be in English.
2. Painting color is to be of manufacturer's standard.

3. Unless otherwise designated in the specifications, the brushes shall comply with the JIS Standards.
4. Designated Maker Shinchi Shoten K.K.

4. Submittals:

The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment).

S-16

Spec. No. 16.5.10
Box Block with V-groove

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 set

3. Specifications; (Constructional dimension, electrical and mechanical requirements)

Type:	K type with a clamp	
Dimensions:	150 mm(L) x 150 mm(W) x 150 mm(H)	
Accuracy:	A class	
	Squareness	± 8 μm
	Flatness	8 μm
	Parallelism	8 μm

Notes:

1. The descriptions on the nameplate shall be in English, and the nameplate to be fitted on a metal case or cover shall include the name of article, manufacture date, manufacture number, and the name of maker. Other indications on the panel shall also be in English.
2. Painting color is to be of manufacturer's standard.
3. Unless otherwise designated in the specifications, the box block with V-groove shall comply with the JIS Standards.
4. Designated Maker Shinchi Shoten K.K.

4. Submittals:
The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment)

S-16

Spec. No. 16.5.11
Universal Type Screen Projector

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity; 1 unit

3. Specifications: (Constructional dimensions, electrical and mechanical requirements)

Model and type:	TOPCON BP-30; table set type	
Dimensions of projector proper:	Projection diameter 300 mm on the screen, 100 cm(H) x 44 cm(W) x 80.5 cm(L)	
	Inching slide block:	D type
	Height of the object that can be projected	0 – 55 mm.
	Area of the inching slide block	180 mm(L) x 160 mm(W)
	Unit of reading	0.005 mm
	Lens cylinder	Turret mount type
	Power source	230V, single-phase incorporated.
	Halogen light	
Accessories	Lenses	x 5, x 10, x 20, x 50, x 100
	Reflective light	Auxiliary condenser lens of 5 magnifications
	Penetrative light	Auxiliary condenser lenses of the light collection type with 50 and 100 magnifications
	Rotary screen	300 mmϕ
	Read-out scale	
	Magnifier	
	Measuring table	
	Halogen lamp	100 W, 12V . . . 7
		150 W, 24V . . . 7
	Standard accessories	As specified in paragraph 4

Notes:

1. The descriptions on the nameplate shall be in English, and the nameplate to be fitted on a metal case or cover shall include the name of articles, manufacture

date, manufacture number, and the name of maker. Other indications on the panel shall also be in English.

2. Painting color is to be of manufacturer's standard.
3. Unless otherwise designated in the specifications, the universal type screen projector shall comply with the JIS Standards.
4. Designated Maker, Ryokosha

4. Accessories and Spares:

Standard accessories: Fixed screen, filament checking lens, adaptor lens mount, light shielding plate, power supply cord, vinyl cover, silicon cloth, and cleaning brush.

5. Submittals:

The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment).

S-16

Spec. No. 16.5.12
Air Compressor

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 unit

3. Specifications: (Constructional dimensions, electrical and mechanical requirements)

Type:	SU-07NBR		
Specifications:	Automatic unloader type designed for continuous operation		
	Working pressure range	5.5 – 7 kg/cm^2	
	Air tank capacity	65 liters	
	Air vent port	PF 1/4 x 2 (RR-A)	
	Air delivery	100 ℓ/min	
	Compressor speed	1,270 rpm	
	Motor output	0.75 kW, 3-phase, 400V	
	Dimensions	Approx. 955 x 470 x 720 (mm)	
Accessories	Air duster	AG-5	1
	Spray gun	W-71-1G, cup PS-4S	1 set
	Hose	10 m, connecting joint (Aj-4) at both ends of the hose,	2
	Connecting joint	AJ-4 hose band,	4 each (for spare)

Notes:

1. The descriptions on the nameplate shall be in English, and the nameplate to be fitted on a metal case or cover shall include the name of article, manufacture date, manufacture number, and the name of maker. Other indications on the panel shall also be in English.
2. Painting color is to be of manufacturer's standard.
3. Unless otherwise designated in the specifications, the air compressor shall comply with the JIS Standards.
4. Designated Maker Shinchi Shoten K.K.

Spec. No. 16.5.12

4. Accessories and Spares

The accessories and spares shall be as entered in the space for specifications.

5. Submittals:

The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment)

S-16

Spec. No. 16.5.13
Surface Plates

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 each

3. Specifications: (Constructional dimensions, electrical and mechanical requirements)

1.	Precision type stone surface plate	750 mm x 500 mm Flatness of less than 9μm (1st class, JIS standards) Made of hard stone	1
2.	Box type surface plate	1,000 mm x 750 mm x 125 mm Machine finished B class Made of cast iron	1

Notes:

1. The descriptions on the nameplate shall be in English, and the nameplate to be fitted on a metal case or cover shall include the name of maker.
   Other indications on the panel shall also be in English.
2. Painting color is to be of manufacturer's standard.
3. Unless otherwise designated in the specifications, the surface plates shall comply with the JIS standards.
4. Designated Maker Shinchi Shoten K.K.

4. Submittals:
   The following shall be submitted in the number of copies specified below

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment)

S-16

Spec. No. 16.5.14
Micrometers

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 set

3. Specifications: (Constructional dimensions, electrical and mechanical requirements)

1. Outside micrometers JIS B7502

(i)	M110-25	Measuring range	0 – 25 mm	Accuracy	±2μm	3
(ii)	M110-50	Measuring range	25 – 50 mm	Accuracy	±2μm	2
(iii)	OM75	Measuring range	50 – 75 mm	Accuracy	±2μm	1
(iv)	OM100	Measuring range	75 – 100 mm	Accuracy	±3μm	1
(v)	OM125	Measuring range	100 – 125 mm	Accuracy	±3μm	1
(vi)	OM150	Measuring range	125 – 150 mm	Accuracy	±3μm	1
(vii)	OM175	Measuring range	150 – 175 mm	Accuracy	±4μm	1

Each of the micrometers specified in (ii) and (iii) through (vii) shall be provided with a micrometer reference rod and shall be encased. The individual case shall be entered with each measuring range.

2. Inside micrometers Caliper type

(i)	IMP25	Measuring range	5 – 25 mm	Accuracy	±7μm	2
(ii)	IMP50	Measuring range	25 – 50 mm	Accuracy	±8μm	1
(iii)	IMZ	Measuring range	50 – 150 mm	Accuracy	±10μm	1

Each micrometers shall be encased, and the individual cases shall be entered with each measuring range.

3. Depth micrometer

(i)	DMS60-25	Measuring range	0 – 25 mm	1
		Base area	60 x 18 mm	

Spec. No. 16.5.14

(ii)	DMC 60-150	Measuring range	0 – 150 mm	1 set
		Change rod	*6*	

The micrometer specified in (ii) shall be encased with the change rods, the accessories to this micrometer. Each case shall have the measuring range entered on the surface.

4. Micrometer stand MS-R type

Notes:

1. The descriptions on the nameplate shall be in English, and the nameplate to be fitted on a metal case or cover shall include the name of article, manufacture date, manufacture number, and the name of maker. Other indications on the panel shall also be in English.
2. Painting color is to be of manufacturer's standard.
3. Unless otherwide designated in the specifications, the micrometers shall comply with the JIS Standards.
4. Designated Maker, Shinchi Shoten K.K.

4. Accessories and Spares:
The accessories and spares shall be as entered in the space for specifications.

5. Submittals:
The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment)

S-16

Spec. No. 16.5.15
Vernier Calippers and Vernier Height Gauges

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 set

3. Specifications: (Constructional dimensions, electrical and mechanical requirements)

   1. Vernier caliper

	Type	Nominal size	Minimum unit of reading	Quantity	Remarks
i)	N15	150 mm	0.05 mm	5	JIS B7507
ii)	NM13	130 mm	0.02 mm by inching feed	2	
iii)	N30	300 mm	0.05 mm	2	JIS B7507

   2. Vernier height gauge

	Type	Nominal size	Minimum unit of reading	Quantity	Remarks
i)	H630	300 mm	0.02 mm	1	
ii)	H425	250 mm	0.02 mm	1	Used both as measurement and marking off

Notes:

1. The descriptions on the nameplate shall be in English, and the nameplate to be fitted on a metal case or cover shall include the name of article, manufacture date, manufacture number, and the name of maker.
   Other indications on the panel shall also be in English.
2. Painting color is to be of manufacturer's standard.

Spec No. 16.5.15

3. Unless otherwise designated in the specifications, the Vernier Calippers and Vernier Hight Gauges shall comply with the JIS Standards.
4. Designated Maker, Shinchi Shoten K.K.

4. Accessories and Spares:

5. Submittals:
The following shall be submitted in the number of copies specified below.

Instruction manual	*(English)*	*(5 copies)*
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment)

6. Remarks:
Each of the Verniers shall be encased and the individual cases shall have the measuring range entered on the surface.

S-16

Spec. No. 16.5.16
Dial Gauges and Stands

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 set

3. Specification: (Construction dimensions, electrical requirement and mechanical requirement etc.)

Item No.	Name	Specification	Quantity	Remarks
1.	Dial gauge	2044 E type 0.01 scale measuring range 5 mm	3 pcs.	JIS B7503
	Dial gauge	2048 E type 0.01 scale measuring range 10 mm	2 pcs.	JIS B7503
	Dial gauge	2109 type 0.001 scale measuring range 1 mm	2 pcs.	JIS B7509
2.	Lever type dial gauge	T1-13 type 0.01 scale 0-4-0	1 pc.	JIS B7533
	Lever type dial gauge	T1-23H type 0.01 scale 0-25-0	1 pc.	JIS B7533
	Lever type dial gauge	T1-12H type 0.002 scale 0-100-0	1 pc.	JIS B7533
3.	Cylinder gauge	CG-S10A type ϕ6-10 mm	1 pc.	
	Cylinder gauge	CG-S18A type ϕ10-18.5 mm	1 pc.	
	Cylinder gauge	CG-35A type ϕ18-35 mm	1 pc.	
	Cylinder gauge	CG-60A type ϕ35-60 mm	1 pc.	
	Cylinder gauge	CG-150A type ϕ50-150 mm	1 pc.	
4.	Dial gauge stand	7001 type effective measuring range 0-100 mm	1 stand	

Spec. No. 16.5.16

Item No.	Name	Specification	Quantity	Remarks
		Diameter of measuring stand 60 mm		
	Dial gauge stand	703 type base 220 x 50 x 32 mm Stand pole diam. ϕ20 mm	1 stand	
5.	Magnetic stand	7011S, Control rod type measuring range 0-350 mm	1 stand	
	Magnetic stand	7010S type range 0-350 mm	1 stand	
6.	Dial depth gauge	Base 15 x 60 mm, measuring range 0-200 mm, connecting rod 5, scale 0.01 mm	1 set	

Note:

1. A name plate, on which name of item, date manufactured, serial number and name of manufacturing company are described in English, is attached to panel, metal casing or cover. All the other descriptions on panel are to be in English.
2. Painting color is to be of manufacturer's standard.
3. Anything but the specified in this specification is to be subject to JIS.
4. Manufacturer Nominated: Shinchi Shoten K.K.

Materials to be submitted:

Operational instruction manual	(English)	(5 copies)
Operational instruction manual	(Japanese)	(3 copies)
Test resulting sheet		(3 copies)
Catalogue		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One each of them is attached to the equipment)

Spec. No. 16.5.16

5. Remarks:
Each of various gauges is put in wooden box, and name of item and measuring range are to be described on the box surface.

S-16

Spec. No. 16.5.17
Squares and Straight-edges

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 set

3. Specification: (Construction dimensions, electrical requirement and mechanical requirement etc.)

	Name	Specification	Quantity	Remarks
1.	Flat type square	Hardening, 75 mm x 50 mm 1st class	1 pc.	JIS B7526
	Flat type square	Hardening, 100 mm x 70 mm 1st class	1 pc.	JIS B7526
	Flat type square	Hardening, 200 mm x 130 mm 1st class	1 pc.	JIS B7526
2.	Straightedge	Knife type 150 mm(L) x 25 mm(W) straightness 3μm	1 pc.	
	Straightedge	1 beam type 300 mm x 40 mm x 8 mm straightness 10μm parallelism 10μm	1 pc.	JIS B7514

Notes:

1. A name plate, on which name of item, date manufactured, serial number and name of manufacturing company are to be described in English, is attached to panel, metal casing or cover. All the other description on panel are to be described in English.
2. Painting color is to be of manufacturer's standard.
3. Anything but the specified in this specification is to be subject to JIS.

Spec. No. 16.5.17

4. Manufacture Nominated; Shinchi Shoten K.K.

4. Materials to be submitted:

Operation instruction manual	(English)	(5 copies)
Operation instruction manual	(Japanese)	(3 copies)
Test resulting sheet		(3 copies)
Catalogue		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One each of them is attached to the equipment)

5. Remarks

Each of them is to be put in a wooden box.

S-16

Spec. No. 16.5.18
Scales and Gauges

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity 1 set

3. Specification: (Construction dimension, electrical requirement and mechanical requirement etc.)

Item		Specification		Quantity
1. Scales				
1)	Metal-made linear scale;	Stainless steel made	15 cm	6 pcs.
	Metal-made linear scale;	Stainless steel made	30 cm	3 pcs.
	Metal-made linear scale;	Stainless steel made	1 m	2 pcs.
2)	Folding scale	Wooden made 6 folded	1 m	6 pcs.
3)	Convex ruler	A type	2 m	6 pcs.
	Convex ruler	D type	3.5 m	2 pcs.
4)	Steel tape measure	in metal case	30 m	1 pc.
5)	Linen tape measure		50 m	1 pc.
2. Thickness gauge		No. 65 M type, 65 mm x 12.7 mm, 25 sheets makes one bundle		2 pcs
3. Radius gauge		For angle corner 272 type, MA075-5 mm		1 pc.
Radius gauge		For angle corner 272 type, MB5.5-13 mm		1 pc.
Radius gauge		For angle corner 272 type, MC13-22 mm		1 pc
Radius gauge		For angle corner 272 type, MD23-30 mm		1 pc.

Spec. No. 16.5.18

	Item	Specification	Quantity
	Radius gauge	For angle corner 272 type, ME31-40 mm	1 pc.
	Radius gauge	For circle groove 178 type, MA1.0-7 mm	1 pc.
	Radius gauge	For circle groove 178 type, MB7.5-15 mm	1 pc.
	Radius gauge	For circle groove 178 type, MC16-23 mm	1 pc.
	Radius gauge	For circle groove 178 type, MD24-30 mm	1 pc.
	Radius gauge	For circle groove 178 type, ME31-40 mm	1 pc.
4.	Center gauge	For 55°	1 sheet
	Center gauge	For 60°	1 sheet
5.	Screw pitch gauge	137 type, whitworth, 4-60 threads, 26 sheets in one bundle	1 pc.
	Screw pitch gauge	156M type, 0.25-2.5, 28 sheets in one bundle	1 pc.
6.	Wire gauge	SWG, No. 1 - No. 36	1 pc.
	Wire gauge	BSWG, 0 - 36	1 pc.
7.	Bar type tention gauge	Max. 110 gr to be measurable	1 pc.
	Bar type tention gauge	Max. 300 gr to be measurable	1 pc.
	Bar type tention gauge	Max. 1 kg to be measurable	1 pc.
	Bar type tention gauge	Max. 3 kg to be measurable	1 pc.
	Bar type tention gauge	Max. 5 kg to be measurable	1 pc.
8.	Dial type tention gauge	Indicated to be the toward DT-30 1-30-1	1 pc.
	Dial type tention gauge	Indicated to be the toward DT-50 2-50-2	1 pc.
	Dial type tention gauge	Indicated to be the toward DT-100 5-100-5	1 pc.
	Dial type tention gauge	Indicated to be the toward DT-300 10-300-10	1 pc.
9.	Sector tention gauge	Indicated to be the toward 500-0-500	1 pc.

Note:

1. A name plate, on which name of item, date manufactured, serial number and

name of manufacturing company are described in English, is attached to panel, metal casing or cover. All the other description on panel are to be described in English.

2. Painting color is to be of manufacturer's standard.
3. Anything but the specified in this specification is to be subject to JIS.
4. Manufacturer Nominated, Shinchi Shoten K.K.

4. Materials to be submitted:

Operation instruction manual	(English)	(5 copies)
Operation instruction manual	(Japanese)	(3 copies)
Test resulting sheet		(3 copies)
Catalogue		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One each of them is to be attached to the equipment)

5. Remarks:

Gauges are properly accommodated in wooden box.

S-16

Spec. No. 16.5.19
Implements for Measuring Work

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 set

3. Specification: (Construction dimensions, electrical requirement and mechanical requirement etc.)

		Quantity
1)	Gauge block for micrometer inspection Type BM-1-10A, for 0-25 mm with optical parallel	1 set
2)	V block 2 pcs., one set, with clamp, 36 mm x 40 mm x 45 mm	1 set
	V block A type 100 mm x 60 mm x 30 mm fitting item	1 set
3)	Precision Level Flat type, 200 mm long, the second kind (sensitivity 0.05)	1 pc. JIS B7511
4)	Universal bevel protractor with 2 brade (150, 300 mm), min. unit of reading 5'	1 pc.
5)	Lighting magnifying-lense SKK-B, for sextuple with 2 lenses	1 pc.

Notes:

1. A name plate, on which name of item, date manufactured, serial number and name of manufacturing company are described in English, is attached to panel, metal casing or cover. All the other descriptions on panel are to be described in English.

Spec. No. 16.5.19

2. Painting color is to be of manufacturer's standard.
3. Anything but the specified in this specification is to be subject to JIS.
4. Manufacturer Nominated: Shinchi Shoten K.K.

4. Materials to be submitted:

Operational instruction manual	(English)	(5 copies)
Operational instruction manual	(Japanese)	(3 copies)
Test resulting sheet		(3 copies)
Catalogue		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One each of them is to be attached to the equipment).

S-16

Spec. No. 16.5.20
Cutting Tools

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 set

3. Specification (Construction dimensions, electrical requirement and mechanical requirement, etc.)

Item	Specification	Quantity	Remarks
1. Straight shank drill	ϕ0.5 mm	10 pcs.	JIS B4312
Straight shank drill	ϕ0.85 mm	10 pcs.	JIS B4312
Straight shank drill	ϕ1.0 mm	10 pcs.	JIS B4312
Straight shank drill	ϕ1.1 mm	10 pcs.	JIS B4312
Straight shank drill	ϕ1.2 mm	10 pcs.	JIS B4312
Straight shank drill	ϕ1.6 mm	10 pcs.	JIS B4312
Straight shank drill	ϕ1.8 mm	10 pcs.	JIS B4312
Straight shank drill	ϕ2.0 mm	20 pcs.	JIS B4312
Straight shank drill	ϕ2.2 mm	20 pcs.	JIS B4312
Straight shank drill	ϕ2.4 mm	20 pcs.	JIS B4312
Straight shank drill	ϕ2.8 mm	20 pcs.	JIS B4312
Straight shank drill	ϕ3.0 mm	40 pcs.	JIS B4312
Straight shank drill	ϕ3.2 mm	40 pcs.	JIS B4312
Straight shank drill	ϕ3.8 mm	20 pcs.	JIS B4312
Straight shank drill	ϕ4.0 mm	40 pcs.	JIS B4312
Straight shank drill	ϕ4.3 mm	40 pcs.	JIS B4312
Straight shank drill	ϕ4.8 mm	20 pcs.	JIS B4312
Straight shank drill	ϕ5.0 mm	20 pcs.	JIS B4312
Straight shank drill	ϕ5.3 mm	20 pcs.	JIS B4312
Straight shank drill	ϕ5.7 mm	10 pcs.	JIS B4312
Straight shank drill	ϕ6.0 mm	20 pcs.	JIS B4312
Straight shank drill	ϕ6.4 mm	20 pcs.	JIS B4312
Straight shank drill	ϕ6.7 mm	10 pcs.	JIS B4312

Spec. No. 16.5.20

	Item	Specification	Quantity	Remarks
	Straight shank drill	ϕ7.7 mm	10 pcs.	JIS B4312
	Straight shank drill	ϕ8.0 mm	10 pcs.	JIS B4312
	Straight shank drill	ϕ8.4 mm	6 pcs.	JIS B4312
	Straight shank drill	ϕ9.7 mm	6 pcs.	JIS B4312
	Straight shank drill	ϕ10.0 mm	6 pcs.	JIS B4312
	Straight shank drill	ϕ10.5 mm	3 pcs.	JIS B4312
	Straight shank drill	ϕ12.0 mm	5 pcs.	JIS B4312
	Straight shank drill	ϕ12.5 mm	2 pcs.	JIS B4312
	Straight shank drill	ϕ13.5 mm	2 pcs.	JIS B4312
2.	Center drill	Pyramid diameter ϕ0.7 mm 1 type	10 pcs.	JIS B4304
	Center drill	Pyramid diameter ϕ1.0 mm 1 type	10 pcs.	JIS B4304
	Center drill	Pyramid diameter ϕ1.5 mm 1 type	10 pcs.	JIS B4304
	Center drill	Pyramid diameter ϕ2.0 mm 1 type	10 pcs.	JIS B4304
	Center drill	Pyramid diameter ϕ3.0 mm 1 type	10 pcs.	JIS B4304
3.	Hand tap	Diameter ϕ1.4 mm x 0.3 mm 3 pcs. 1 set	3 sets	meter coarse
	Hand tap	Diameter ϕ2.0 mm x 0.4 mm 3 pcs. 1 set	5 sets	
	Hand tap	Diameter ϕ3.0 mm x 0.5 mm 3 pcs. 1 set	9 sets	
	Hand tap	Diameter ϕ4.0 mm x 0.7 mm 3 pcs. 1 set	9 sets	
	Hand tap	Diameter ϕ5.0 mm x 0.8 mm 3 pcs. 1 set	6 sets	
	Hand tap	Diameter ϕ6.0 mm x 1.0 mm 3 pcs. 1 set	5 sets	
	Hand tap	Diameter ϕ8.0 mm x 1.25 mm 3 pcs. 1 set	2 sets	
	Hand tap	Diameter ϕ10.0 mm x 1.5 mm 3 pcs. 1 set	2 sets	

S-16

Spec. No. 16.5.20

	Item	Specification		Quantity	Remarks
	Hand tap	Diameter ϕ12.0 mm x 1.75 mm 3 pcs. 1 set		1 set	
	Hand tap	Diameter ϕ14.0 mm x 2.0 mm 3 pcs. 1 set		1 set	
	Hand tap	Diameter ϕ16.0 mm x 2.0 mm 3 pcs. 1 set		1 set	
4.	Thread cutting round dies	Screw diameter	1.4 mm	2 pcs.	JIS B4451 meter coarse adjustable
		Outside diameter	16 mm		
	Thread cutting round dies	Screw diameter	2.0 mm	3 pcs.	
		Outside diameter	16 mm		
	Thread cutting round dies	Screw diameter	3.0 mm p0.5 mm	5 pcs.	
		Outside diameter	20 mm		
	Thread cutting round dies	Screw diameter	4.0 mm p0.7 mm	5 pcs.	
		Outside diameter	20 mm		
	Thread cutting round dies	Screw diameter	5.0 mm p0.8 mm	3 pcs.	
		Outside diameter	20 mm		
	Thread cutting round dies	Screw diameter	6.0 mm	3 pcs.	
		Outside diameter	20 mm		
	Thread cutting round dies	Screw diameter	8.0 mm	1 pc.	
		Outside diameter	20 mm		
	Thread cutting round dies	Screw diameter	10.0 mm	1 pc.	
		Outside diameter	38 mm		
	Thread cutting round dies	Screw diameter	12.0 mm	1 pc.	
		Outside diameter	38 mm		
	Thread cutting round dies	Screw diameter	14.0 mm	1 pc.	
		Outside diameter	38 mm		
5.	Counterbore for countersunk screw	Guide diameter	ϕ3.2 mm Nominal M3	4 pcs.	JIS B4235
	Counterbore for countersunk screw	Guide diameter	ϕ4.3 Nominal M4	5 pcs.	

S-16

Spec. No. 16.5.20

	Item	Specification		Quantity	Remarks
	Counterbore for countersunk screw	Guide diameter	ϕ5.3 Nominal M5	4 pcs.	
	Counterbore for countersunk screw	Guide diameter	ϕ6.4 M6	3 pcs.	
6.	Counterbore for flat fillister head screw	Guide diameter	ϕ3.2 mm Nominal M3	4 pcs.	JIS B4233 1 type
	Counterbore for flat fillister head screw	Guide diameter	ϕ4.3 mm Nominal M4	5 pcs.	
	Counterbore for flat fillister head screw	Guide diameter	ϕ5.3 mm Nominal M5	4 pcs.	
	Counterbore for flat fillister head screw	Guide diameter	ϕ6.4 mm Nominal M6	3 pcs.	
	Counterbore for flat fillister head screw	Guide diameter	ϕ8.4 mm Nominal M8	3 pcs.	
7.	Counterbore for hexa hexagon socket head bolt	Guide diameter	ϕ6.4 mm Nominal M6	1 pc.	JIS B4236
	Counterbore for hexagon socket head bolt	Guide diameter	ϕ8.4 mm Nominal M8	1 pc.	
	Counterbore for hexagon socket head bolt	Guide diameter	ϕ10.5 mm Nominal M10	1 pc.	
	Counterbore for hexagon socket head bolt	Guide diameter	ϕ13 mm Nominal M12	1 pc.	
8.	Taper shank drill	ϕ15 M.T2		1 pc.	
	Taper shank drill	ϕ20 M.T2		1 pc.	
	Taper shank drill	ϕ25 M.T3		1 pc.	

Spec. No. 16.5.20

	Item	Specification		Quantity	Remarks
9.	High speed steel tool bits	SkH4 8 mm square x 65 length		6 pcs.	JIS B4151
	High speed steel tool bits	SkH4 12 mm square x 100 length		6 pcs.	
	High speed steel tool bits	SkH4 14 mm square x 110 length		6 pcs.	
10.	Welded tipped tool bits	Diamond point tipped, nomination #2, 16 mm		5 pcs.	JIS B4152
	Welded tipped tool bits	Round tipped, nomination #2, 16 mm		5 pcs.	
	Welded tipped tool bits	Knife, right, nomination #2, 16 mm		5 pcs.	
	Welded tipped tool bits	Knife, left, nomination #2, 16 mm		3 pcs.	
	Welded tipped tool bits	Cutting-off, nomination #2, 16 mm		5 pcs.	
	Welded tipped tool bits	For bored, nomination #2, 16 mm		3 pcs.	
11.	Knurling tool	Skew, right and left set, coarse		1 set	
	Knurling tool	Skew, right and left set, middle		1 set	
	Knurling tool	Skew, right and left set, fine		1 set	
	Knurling tool	Parallel, middle		1 set	
	Knurling tool	Parallel, fine		1 set	
12.	Knuring tool holder	With two pcs.		1 set	
13.	Straight shank end milling	Double cutting edge shank diameter	ϕ3 mm ϕ4 mm	5 pcs.	JIS B4208
	Straight shank end milling	Double cutting edge shank diameter	ϕ4 mm ϕ4 mm	5 pcs.	

Spec. No. 16.5.20

	Item	Specification		Quantity	Remarks
	Straight shank end milling	Double cutting edge shank diameter	ϕ5 mm ϕ6 mm	5 pcs.	
	Straight shank end milling	Double cutting edge shank diameter	ϕ6 mm ϕ6 mm	5 pcs.	
	Straight shank end milling	Double cutting edge shank diameter	ϕ8 mm ϕ8 mm	3 pcs.	
	Straight shank end milling	Double cutting edge shank diameter	ϕ10 mm ϕ10 mm	3 pcs.	
	Straight shank end milling	Double cutting edge shank diameter	ϕ12 mm ϕ12 mm	3 pcs.	
	Straight shank end milling	Torsion cutting edge shank diameter	ϕ6 mm ϕ6 mm	3 pcs.	JIS B4211
	Straight shank end milling	Torsion cutting edge shank diameter	ϕ8 mm ϕ8 mm	3 pcs.	
	Straight shank end milling	Torsion cutting edge shank diameter	ϕ10 mm ϕ10 mm	3 pcs.	
	Straight shank end milling	Torsion cutting edge shank diameter	ϕ12 mm ϕ12 mm	3 pcs.	
	Straight shank end milling	Torsion cutting edge shank diameter	ϕ15 mm ϕ12 mm	5 pcs.	
	Straight shank end milling	Torsion cutting edge shank diameter	ϕ20 mm ϕ16 mm	5 pcs.	
14.	Face milling cutter with insert blade	Nomination 4R d 31.75 mm, number of cutters 4		1 pc.	For steel
15.	Grinding wheel	Outdia. ϕ180 mm x inner ϕ31.75 mm x width 19 mm for planer		16 pcs. (total)	
		WA, 46, J, 50%, V, planer 1	2 pcs.		
		WA, 60, J, 50%, V, planer 1	2 pcs.		
		WA, 80, J, 50%, V, planer 1	2 pcs.		
		WA, 120, K, 50%, V, planer	2 pcs.		

Spec. No. 16.5.20

	Item	Specification		Quantity	Remarks
		C, 46, J, 50%, V, planer 1	2 pcs.		
		C, 60, J, 50%, V, planer 1	2 pcs.		
		GC, 80, J, 50%, V, planer 1	2 pcs.		
		GC, 60, K, 50%, V, planer 1	2 pcs.		
	Grinding wheel	Outdia. ϕ150 mm x inner ϕ12.7 mm x wide 16 mm		2 pcs. (total)	
		A36N, V, planer 1,	1 pc.		
		GC46k, V, planer 1,	1 pc.		
16.	Hand reamer	ϕ1.0 mm		5 pcs.	
	Hand reamer	ϕ2.0 mm		5 pcs.	
	Hand reamer	ϕ3.0 mm		6 pcs.	
	Hand reamer	ϕ4.0 mm		6 pcs.	
	Hand reamer	ϕ5.0 mm		6 pcs.	
	Hand reamer	ϕ6.0 mm		5 pcs.	
	Hand reamer	ϕ8.0 mm		5 pcs.	
	Hand reamer	ϕ10.0 mm		5 pcs.	
17.	Hole saw	S type ϕ28 mm		1 pc.	
	Hole saw	S type ϕ35 mm		1 pc.	
	Hole saw	S type ϕ45 mm		1 pc.	
	Hole saw	S type ϕ53 mm		1 pc.	
18.	Hand hack-saw blade	L300 mm x 12 mm x 0.64 mm 18 thread/inch		50 sheets	JIS B4751
	Hand hack-saw blade	L300 mm x 12 mm x 0.64 mm 24 thread/inch		50 sheets	
19.	Hand tap	W1/16 (Whitworth)		2 sets	
	Hand tap	W3/12 (Whitworth)		2 sets	
	Hand tap	W1/8 (Whitworth)		2 sets	
	Hand tap	W5/32 (Whitworth)		2 sets	

Spec. No. 16.5.20

	Item	Specification		Quantity	Remarks
	Hand tap	W3/16 (Whitworth)		2 sets	
	Hand tap	W7/32 (Whitworth)		1 set	
	Hand tap	W1/4 (Whitworth)		1 set	
	Hand tap	W5/16 (Whitworth)		1 set	
	Hand tap	W3/8 (Whitworth)		1 set	
20	Thread cutting round dies	W1/16 (Whitworth)	Adjustable	1 pc.	
	Thread cutting round dies	W3/32 (Whitworth)	Adjustable	1 pc.	
	Thread cutting round dies	W1/8 (Whitworth)	Adjustable	1 pc.	
	Thread cutting round dies	W5/32 (Whitworth)	Adjustable	1 pc.	
	Thread cutting round dies	W3/16 (Whitworth)	Adjustable	1 pc.	
	Thread cutting round dies	W7/32 (Whitworth)	Adjustable	1 pc.	
	Thread cutting round dies	W1/4 (Whitworth)	Adjustable	1 pc	
	Thread cutting round dies	W5/16 (Whitworth)	Adjustable	1 pc.	
	Thread cutting round dies	W3/8 (Whitworth)	Adjustable	1 pc.	
21.	Tap for pipe threads	American taper NPT	1/8	1 set	TAS4114
	Tap for pipe threads	American taper NPT	1/4	1 set	
	Tap for pipe threads	American taper NPT	3/8	1 set	
	Tap for pipe threads	American taper NPT	1/2	1 set	
	Tap for pipe threads	American taper NPT	3/4	1 set	
	Tap for pipe threads	American taper NPT	1	1 set	

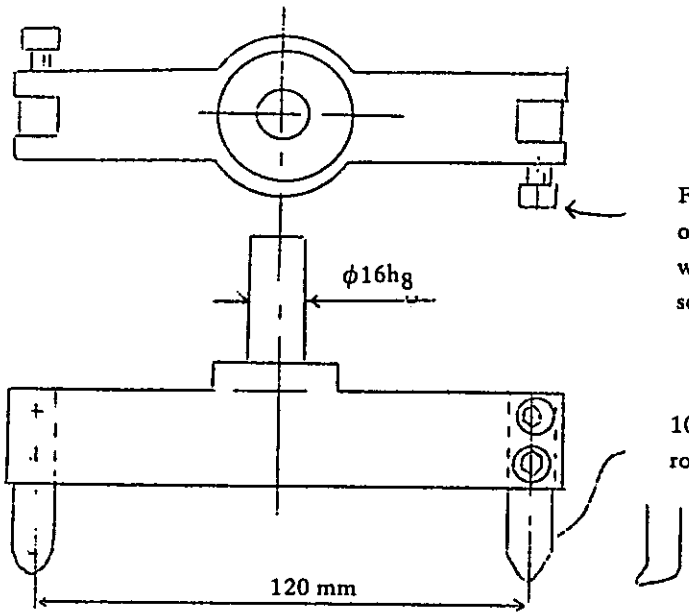
Spec. No. 16.5.20

	Item	Specification		Quantity	Remarks
22.	Dies for pipe threads	American taper	1/8	1 pc.	
	Dies for pipe threads	American taper	1/4	1 pc.	
	Dies for pipe threads	American taper	3/8	1 pc.	
	Dies for pipe threads	American taper	1/2	1 pc.	
	Dies for pipe threads	American taper	3/4	1 pc.	
	Dies for pipe threads	American taper	1	1 pc.	
23.	File for iron work	250 mm flat, bastard cut		5 pcs.	JIS B4703
	File for iron work	250 mm flat, second cut		5 pcs.	
	File for iron work	250 mm flat, fine		7 pcs.	
	File for iron work	250 mm semi-round, bastard cut		5 pcs.	
	File for iron work	250 mm semi-round, second-cut		3 pcs.	
	File for iron work	250 mm square, second-cut		3 pcs.	
	File for iron work	200 mm flat, middle		7 pcs.	
	File for iron work	200 mm flat, fine		10 pcs.	
	File for iron work	200 flat, dead-smooth-cut		10 pcs.	
	File for iron work	200 mm round, bastard cut		5 pcs.	
	File for iron work	200 mm round, second cut		7 pcs.	
	File for iron work	200 mm round, fine		7 pcs.	
	File for iron work	200 mm semi-round, second cut		7 pcs.	
24.	Assorted set of files	5 pcs. set, 215 mm, second cut		7 sets	JIS B4704
	Assorted set of files	5 pcs. set, 215 mm, fine		7 sets	
	Assorted set of files	5 pcs. set, 215 mm, dead-smooth-cut		7 sets	
25.	Assorted set of files for precision	8 pcs. set, 180 mm		5 sets	
26.	File for aluminum	250 mm		2 pcs.	
	File for aluminum	200 mm		3 pcs.	

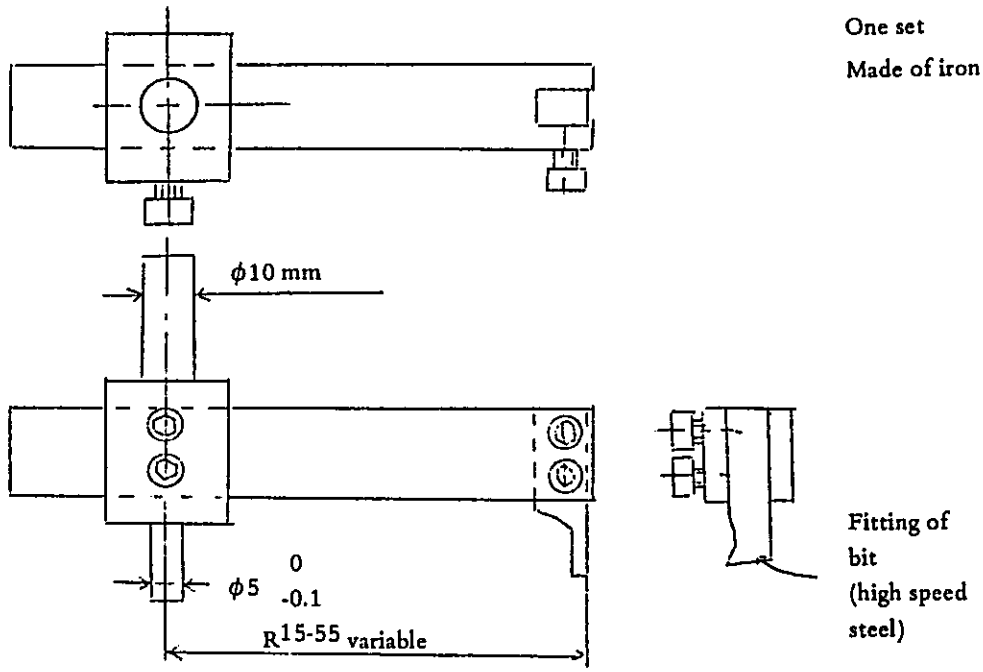
S-16

Spec. No. 16.5.20

27. Facing and Milling Head In accordance with the drawings below



28. Hole Saw Attachment In accordance with the drawings below



S-16

Spec. No. 16.5.20

	Item	Specification	Quantity	Remarks
29.	Shell end milling	Outside ϕ100 mm x inner ϕ31.75 mm x width 60 mm	1 pc.	JIS B4214 common cutter
30.	Side cutter	75 mm x 6 mm x 25.4 mm	1 pc.	JIS B4206 common cutter
	Side cutter	75 mm x 10 mm x 25.4 mm	1 pc.	
	Side cutter	100 mm x 14 mm x 25.4 mm	1 pc.	
31.	Taper shank end milling cutter	ϕ24 mm x cutter length 35 mm, with tang. MT3	2 pcs.	JIS B4212
	Taper shank end milling cutter	ϕ28 mm x cutter length 40 mm, with tang. MT3	2 pcs.	
	Taper shank end milling cutter	ϕ32 mm x cutter length 40 mm, with tang. MT3	2 pcs.	
32.	Single anglar milling cutter	D ϕ75 mm x d ϕ25.4 mm, 45°	1 pc.	JIS B4221
	Single anglar milling cutter	D ϕ75 mm x d ϕ25.4 mm, 60°	1 pc.	
33.	T slot cutter	2 type (straight) nomination 8 18 mm(D) x 18 mm(L)	1 pc.	JIS B4217
		2 type (straight) nomination 14 25 mm(D) x 11 mm(L)	1 pc.	

Spec. No. 16.5.20

Notes:

1. A name plate, on which name of item, date manufactured, serial number and name of manufacturing company are described in English, is attached to panel, metal casing or cover. All the other descriptions on panel are to be described in English.
2. Anything but the specified in this specification is to be subject to JIS'
3. Manufacturer Nominated Shinchi Shoten K.K.

4. Materials to be submitted:

Operational instruction manual	(English)	(5 copies)
Operational instruction manual	(Japanese)	(3 copies)
Test resulting sheet		(3 copies)
Catalogue		(3 copies)
Invoices		(4 copies)
Packing list		(4 copies)

(One each of them is attached to the equipment.)

5. Remarks:

Each of various kinds is to be packed in wooden box separately, on which name of item and nominal signal are to be described in English.

S-16

Spec. No. 16.5.21

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 set

3. Specification: (Construction dimensions electrical requirement and mechanical requirement etc.)

	Item	Specification	Quantity	Remarks
1.	Milling chuck set	SMC 20-40A type in case	1 set	
	Main attachment	Shank taper NT40, chuck int. diameter ϕ20 mm		
	Accessaries standard	Straight collet (C-20) ϕ6, ϕ8, ϕ10, ϕ12, ϕ16 (mm) MT collet No. 1, No. 2, (C-20) Chuck holder 2 1/2 with chuck (C-2- -j6) Centering lever (C20-B10), suspension wrench		
2.	Single point tool holder	10 mm square for single point tool	1 pc.	
3.	Hack-saw frame	30 cm fixed type	2 pcs.	
4.	Tap handle	No. 0 For 1-6 mm	2 pcs.	
	Tap handle	No. 5 For 5-13 mm	2 pcs.	
	Tap handle	No. 7 For 10-25 mm	2 pcs.	
5.	Tap holder	Model No. 88 length 90 mm, tap less than 6 mm used.	2 pcs.	
	Tap holder	Model No. 90 length 125 mm tap less than 13 mm used	2 pcs.	

Spec. No. 16.5.21

	Item	Specification	Quantity	Remarks
6.	Handle for	Diameter ϕ16 mm (capable of putting a round dies in)	2 pcs.	
		Diameter ϕ20 mm	2 pcs.	
		Diameter ϕ25 mm	2 pcs.	
		Diameter ϕ38 mm	2 pcs.	
		Diameter ϕ50 mm	1 pc.	
7.	File handle	Wooden-make middle type	50 pcs.	
8.	Lathe dog	Size 13, ϕ9-13 mm possible	1 pc.	For lathe
	Lathe dog	Size 38, ϕ12-38 mm possible	1 pc.	
9.	Drill chuck	Nominal 13 mm (2 ½) chuck, with Chuck arbor (2.½ x M.T.4)	1 set	For lathe
10.	Face mill arbor	Direct attachment N.T. 40 with screw d ϕ31,75 mm x 24 mm(L) with shell, nut and wrench	1 set	For milling machine
11.	Side cutter arbor	Direct attachment N.T. 40 with screw d ϕ25.4 mm x 75 mm(L) with shell, nut and wrench	1 set	For milling machine
12.	Clamp for milling machine	Parallel clamp; nomination 4, 19 mm x 41 mm x 100 mm W/clamping bolt of step square head suitable for T groove of 17 mm width, nut and washer	6 sets	For milling machine
13.	Drill sleeve	M.T. 3 x N.T. 40 with cotter hole	1 pc.	For milling machine

Spec. No. 16.5.21

	Item	Specification	Quantity	Remarks
	Drill sleeve	M.T. 3 x N.T. 4 with tag	1 pc.	For lathe
14.	Angle plate	No. 4, 150 mm x 175 mm right angle squareness ±0.03 mm	1 pc.	For milling machine
		No. 2, 100 mm x 125 mm right angle squareness ±0.02 mm	1 pc.	
15.	Hand tapping	Tapping guide, tap-wrench, tap-holder: M1.4, M2, M3, W1/16, W3/32, W1/8- 6 pcs. in "TAPMATE" TS-112	1 set	
16.	Baby chuck	MB 20-6; chucking inner diameter ϕ6 mm	1 set	For milling machine
	Accessaries	Straight collet 3 pcs. ϕ3, ϕ4, ϕ5 mm collet with nut ϕ6 1 pc. (standard accessary)		

Notes:

1. A name plate, on which name of item, date manufactured, serial number and name of manufacturing company are described in English, is attached to panel, metal casing or cover. All the other descriptions on panel are to be described in English.
2. Manufacturer Nominated, Shinchi Shoten K.K.

4. Materials to be submitted:

Operational instruction manual	(English)	(5 copies)
Operational instruction manual	(Japanese)	(3 copies)
Test resulting sheet		(3 copies)
Catalogue		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One each of them is to attached to the equipment)

S-16

Spec. No. 16.5.22
Surface Roughness Tester

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 set

3. Specification (Construction dimensions, electrical requiremnt and mechanical requirements, etc.)

Model	SE-4A type			
Construction	Amplifire	With meter		
	Tracer	TR50Y		
	Recorder	RJ-41		
	Pick-up	DB type		
	Reference specimen			
	Total weight	20 kg		
Spcification:	Ranges	Meter reading	0.02-50μm	Ra(AA), RMS,
		Recording	0.05-400μm	Rmax, Rz
	Magnifications	V, 100 – 20,000		
		H, 10, 20, 100, 200 times		
	Roughness width cut-off	0.25, 0.8, 2.5 mm		
	Trace stroke	2 – 50 mm variable		
	Trace speeds	0.2, 1.0 mm/s		
	Stylus points	5μmR, 0.4 gr		
	Chart paper recording width	40 mm		
Accessaries	Chart paper for RJ-41	10 roll		

Notes:

1. A name plate, on which name of item, date manufactured, serial number and name of manufacturing company are described in English, is attached to panel, metal casing or cover.
   All the other descriptions on panel are to be described in English.
2. Anything but the specified in this specification is to be subject to JIS.

Spec. No. 16.5.22

3. Manufacturer Nominated, KOSAKA

4. Accessaries and Spare Parts:
As listed on the above.

5. Materials to be submitted:

Operational instruction manual	(English)	(5 copies)
Operational instruction manual	(Japanese)	(3 copies)
Test resulting sheet		(3 copies)
Catalogue		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One each of them is attached to the equipment)

6. Remarks:
Accessaries are to be put in one case, which "For Loughness Tester" are to be described.

S-16

Spec. No. 16.6
Engraving Machine

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 stand

3. Specification: (Construction dimensions, electrical requirement and necessary mechanical requirement etc.)

Type:	SP-V17		
Specification:	Pantograph size	235 mm x 235 mm	
	Reduced rate	1 - 1/50 non-step	
	Work table	Max. feed per strok	uper and lower 360 mm
		Max. feed per strok	right and left 190 mm
		Max. feed per strok	front and rear 260 mm
	Work table area	460 mm x 205 mm	
	Copy table area	530 mm x 375 mm	
	Spindle revolution	15,000, 10,500, 8,800, 6,200 rpm	
	Spindle	Max. feed per stroke	14.3 mm
		Best fine, dipth of cut	3 mm
		Adapted taper of tool bits	B & S 1/24
		Machine hight	1,215 mm
		Floor area	750 mm x 440 mm
		Motor input	230V, single phase

Notes:

1. A name plate, on which name of item, date manufactured, serial number and name of manufacturing company are described in English, is attached to panel, metal casing or cover.
   All the other descriptions on panel are to be described in English.
2. Anything but the specified in this specification is to be subject to JIS.
3. Manufacturer Nominated, SAKAZAKI TEKKO K.K.

Spec. No. 16.6

4. Accessaries and Spare parts

Item	Specification	Quantity	Remarks
1. Standard Accessaries	as listed below		
Clamp	For work, for original type for original type setting	1 set	
Cutting tools	SHK 5	2 pcs.	
Belt	For the machine	1 pc.	
Lubricant oil	Small bottle, for spindle	1 pc.	
Lubricant grease	Small bottle, for the machine	1 pc.	
2. Special Accessaries	as listed in the below		
Standard circle original type	365 mm x 365 mm	1 sheet	
Standard letter original type	English-letters, figures, and marks set	1 set	
Tool grinder	SG-2 with standard accessaries (for Example, cup grinder)	1 set	
Vise of the machine	Jaw extend span 150 mm	1 pc.	
Standard tool	SHK5	1 doz.	
Dresser for correct	For grinding wheel forming, diamond	1 pc.	
Belt	For the machine	1 pc.	Spare

5. Materials to be submitted:

Operational instruction manual	(English)	(5 copies)
Operational instruction manual	(Japanese)	(3 copies)
Test resulting sheet		(3 copies)
Catalogue		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One each of them is attached to the equipment)

S-16

Spec. No. 16.7.1
Precision Lathe

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 stand

3. Specification: (Construction dimensions, electrical requirement and mechanical requirement etc.)

Type:	LPT-35C type	
Specification:	Swing on the bed	360 mm
	Swing on the carriage	180 mm
	Distance between centers	500 mm
	End of main spindle	SAS A1 No. 5
	Taper hole of main spindle	M.T. No. 5
	Center of main spindle	M.T. No. 4
	Rotation of main spindle	56-2500 rpm, 12 steps change-over
	Tail stock center	M.T. No. 4
	Tail spindle sliding distance	120 mm
	Length of bed	1,350 mm
	Carriage sliding length	480 mm
	Cross slide sliding length	245 mm
	Tool slide sliding length	100 mm
	Cross sliding handle gauge	0.025 mm per one gauge
	Tool slide sliding handle gauge	0.02 mm per one gauge
	Motor input	400V, three phase, 4P, 3.7 kW
	Thread cutting	Meter screw 0.25-7 mm,inch screw t.p.i. 112-4
	Lead screw	d 28 mm x p 4 mm
	Size of machine	1,700 mm x 1,080 mm x 1,199 mm
	Net weight	1,200 kg

Note:

1. A name plate, on which name of item, date manufactured, serial number and name

of manufacturing company are described in English, is attached to panel, metal casing or cover.
All the other descriptions on panel are to be described in English.

2. Anything but the specified in this specification is to be subject to JIS.
3. Manufacturer Nominated, Washino Kikai K.K.

4. Accessaries an Spare Parts:

	Item	Specification		Quantity	Remarks
1.	Standard accessaries	As listed in the below			
	Scroll chuck with 3 pawls	No. 7		1 set	
	Driving plate	Outside diameter ϕ160 mm		1 pc.	
	Main spindle bush			1 pc.	
	Fixed center	M.T. No. 3, M.T. 4 with cemented carbide tip		2 pcs.	
	Thread cutter dial			1 pc.	
	Standard electric equipments			1 set	
	Bed stopper			2 pcs.	
	Adjustment tool	Double ended wrench	2 pcs.	1 set	
		Single ended wrench	1 pc.		
		Socket wrench	1 pc.		
		Screw driver	2 pcs.		
		Hexagonal wrench key	6 pcs.		
2.	Special accessaries	As listed in the below			
	Face plate	Outside diameter ϕ280 mm		1 pc.	
	Single acting chuck with 4 pawls	No. 8, pawl hardening		1 set	
	Scroll chuck with 3 pawls	No. 7 for non-hardening pawl, non-hardening pawls, 3 pcs ... spare accessaries		1 set	
	Steady rest	ϕ6-75 mm		1 pc.	

Spec. No. 16.7.1

Item	Specification	Quantity	Remarks
Follow rest	ϕ10-40 mm	1 pc.	
Rotating center	M.T. No. 4	1 pc.	
Copy attachment	B type for LPT-35C	1 unit	

5. Materials to be submitted:

Operational instruction manual	(English)	(5 copies)
Operational instruction manual	(Japanese)	(3 copies)
Test resulting sheet		(3 copies)
Catalogue		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One each of them is attached to the equipment)

S-16

Spec. No. 16.7.2
Precision Surface Grinder

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 stand

3. Specification: (Construction dimensions, electrical requirement and mechanical requirement, etc.)

Type: NSG-315 type

Specification:

Table operation area	300 mm x 150 mm
Table moving distance from right to left	Max. 360 mm
Saddle moving distance back and forth	Max. 160 mm
Saddle feeding back and forth	@0.05 mm per division
Size of grinding wheel:	Outside ϕ180 mm x ϕ31.8 mm x width (10-20) mm
Length from table surface to center of grinding wheel spindle	310 mm
Cutting depth of grinding wheel spindle	@ 1 mm per handle one rotation @ 0.005 mm per division
Number of revolution for grinding wheel spindle	(50 Hz) 2,980 rpm
Grinding wheel spindle motor	230V single phase 0.75 kW
Pumping motor for cooling	230V single phase 80 W
Floor space to be required	1,530 mm x 1,150 mm Height 1,590 mm Weight 600 kg

Note:

1. A name plate, on which name of item, date manufactured, serial number and name of manufacturing company are described in English, is attached to panel, metal casing or cover. All the other descriptions on panel are to be described in English.
2. Anything but the specified in this specification is to be subject to JIS.

Spec. No. 16.7.2

3. Manufacturer Nominated, Nikko Kikai K.K. NSG-315 type

4. Accessaries and Spare Parts:

	Item	Specification	Quantity	Remarks
1.	Standard accessaries	As listed in the below		
	Magnetic chuck	Tilting type, 280 mm x 100 mm x 120 mm	1 stand	
	Grinding wheel	ϕ180 mm x inner ϕ31.8 mm x 10 mm	1 pc.	
	Flange for grinding wheel	For keeping grinding wheel	1 set	
	Diamond tool	For dresser	1 pc.	
	Diamond tool holder	For dresser	1 pc.	
	Dialindicator	For fine reading of front and rear	1 pc.	
	Operational tool	Wrenches 1 set packed in box	1 set	
2.	Special accessaries	As listed in the below		
	Special dresser device	For 550B type 1) angle dresser 2) small radius R dresser (0-20 mmR) 3) small convex R dresser (20-50 mmR) 4) small convex R dresser (50-100 mmR) (100-150 mmR) 5) Concave dresser 6) Parallel dresser 7) Side dresser	1 set	
G	Grinding wheel balancing device	Grinding wheel forming for balancing	1 set	
	Mandrel	Grinding wheel forming for balancing	1 pc.	
	Demagnetizer	For demagnetizing of works	1 stand	
	Cooling device	For wet grinding, sedimentation tank type	1 set	
	Diamond tool	0.5 ct. for dresser	1 pc.	(spare)

S-16

Spec. No. 16.7.2

Item	Specification	Quantity	Remarks
Precision square	Big and small each one	total 2 pcs.	(for measurement checking)

5. Materials to be submitted:

Operational instruction manual	(English)	(5 copies)
Operational instruction manual	(Japanese)	(3 copies)
Test resulting sheet		(3 copies)
Catalogue		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One each of them is attached to the equipment)

S-16

Spec. No. 16.7.3

Presses

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 set

3. Specification: (Construction dimensions, electrical requirement and necessary mechanical requirement etc.)

1	Arbor press:	1 unit	
	Specification:	Up and down moving of ram	380 mm
		Size of frame	210 mm(W) x 430 mm(D) x 610 mm(H)
		Full length of handle	680 mm
2.	Hand eccentric press:	1 unit	
	Type:	Manual 25 Kan	25 Kan
	Specification:	Ram stroke	25.5 mm
		Ram bottom open	125 mm
		Diameter of eccentric shaft	ϕ29 mm
		Size of table	250 mm x 200 mm
		Diameter of shunk hole	ϕ20 mm
	Accessaries:	50 mm square cutting punch	(according to Fig. 1)
		50 mm square cutting die	(according to Fig. 2)

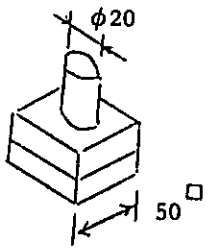


Fig. 1

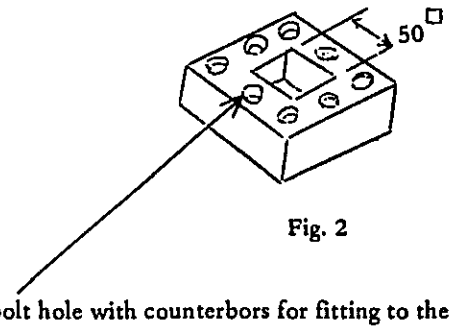


Fig. 2

Spec. No. 16.7.3

Fitting on the above listed eccentric, press, 1mm^{t}Al plate to be able to cut off. (with fixing screws)

1. A name plate, on which name of item, date manufactured, serial number and name of manufacturing company are described in English, is attached to panel, metal casing or cover.
   All the other descriptions on panel are to be described in English.
2. Anything but the specified in this specification is to be subject to JIS.
3. Manufacturer Nominated., Shinchi Shoten K.K.

4. Accessaries and Spare Parts:
   As listed on the above.

5. Materials to be submitted:

Operational instruction manual	(English)	(5 copies)
Operational instruction manual	(Japanese)	(3 copies)
Test resulting sheet		(3 copies)
Catalogue		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One each of them is attached to the equipment)

Spec. No. 16.7.4
Treadle Shearing Machine

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 unit

3. Specification: (Construction dimensions, electrical requirement and mechanical requirement etc.)

Type:	FS 102 type	
Specification:	Thickness of plate sheared	(iron) 1.6 mm
	Proceeding length	1,000 mm
	Weight	360 kg
	With the device of keeping plate	

Notes:

1. A name plate, on which name of item, date manufactured, serial number and name of manufacturing company are described in English, is attached to panel, metal casing or cover.
   All the other descriptions on panel are to be described in English.
2. Anything but the specified in this specification is to be subject to JIS.
3. (Reference, Nomination) Manufacturer Shinchi Shoten K.K.

4. Materials to be submitted:

Operational instruction manual	(English)	(5 copies)
Operational instruction manual	(Japanese)	(3 copies)
Test resulting sheet		(3 copies)
Catalogue		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One each of them is attached to the equipment)

S-16

Spec. No. 16.7.5
Contour Machine

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 unit

3. Specification: (Construction dimensions, electrical requirement and necessary mechanical requirement etc.)

Type:	V500	
Specification:	Length from saw-brade position to column end	Max. 500 mm
	Height of the substance to be cut	300 mm
	Size of the saw to be able to fit	Width 2-19 mm
		Thickness 0.65 mm
		Extended length 3,750 – 3,950 mm
	Speed of saw-brade	Low 15 – 90 m/min.
		High 300 – 1,800 m/min.
		2 steps change
	Table inclination	15° right and left
	Size	1,300 mm(W) x 1,400 mm(D) x 2,150 mm(H)
	Motor	Three phase 400V, 1.5 kW
	With brade welding part	4 kVA (power source 400V, three phase)
Accessaries	1) Screw feeding device	
	2) Workholder	
	3) Straight line ruler	
	4) Band saw blade	
	AA width 6 mm 18 thread/inch 30 m 3 rolls	
	AA width 13 mm 8 thread/inch 30 m 1 rolls	
	AA width 10 mm 14 thread/inch 30 m 6 rolls	

Notes:

1. A name plate, on which name of item, date manufactured, serial number and name of manufacturing company are described in English, is attached to panel, metal casing or cover.

Spec. No. 16.7.5

All the other descriptions on panel are to be described in English.

2. Anything but the specified in this specification is to be subject to JIS.
3. Manufacturer Nominated, Amada K.K.

4. Accessaries and Spare Parts:
   As listed on the above.

5. Materials to be submitted:

Operational instruction manual	(English)	(5 copies)
Operational instruction manual	(Japanese)	(3 copies)
Test resulting sheet		(3 copies)
Catalogue		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One each of them is attached to the equipment)

6. Remarks:
   Accessaries are to be put in one case, which "FOR CONTOUR MACHINE" are to be described.

S-16

Spec. No. 16.7.6
Drilling Machines

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 set

3. Specification: (Construction dimensions, electrical requirement and mechanical requirements, etc.)

1. Table drilling machine
2. High speed drilling machine
3. Radial drilling machine

Details are to be attached.

Notes:

1. A name plate, on which name of item, date manufactured, serial number and name of manufacturing company are described in English, is attached to panel, metal casing or cover. All the other descriptions on panel are to be described in English.
2. Anything but the specified in this specification is to be subject to JIS.
3. Manufacturer Nominated Shinchi Shoten K.K.

4. Accessaries and Spare Parts:
Each machine: With chuck handle and driving belt (including spare 1 pc. each) 2 each

5. Materials to be submitted:

Operational instruction manual	(English)	(5 copies)
Operational instruction manual	(Japanese)	(3 copies)
Test resulting sheet		(3 copies)
Catalogue		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One each of them is attached to the equipment)

Spec. No. 16.7.6

1. Table drilling machine 1 unit

Type:	NBD 340	
Specification:	Max. drill diameter	ϕ13 mm with chuck
	Swing	340 mm
	Number of revolution of main spindle (50 Hz)	450, 1,000, 1,800, 3,200 rpm
	Main spindle feeding range	90 mm
	Table working space	254 mm x 254 mm
	Base working space	182 mm x 220 mm
	Base floor space	448 mm x 260 mm
	Taper of main spindle	J.T. No. 2 1/2
	Max. distance from chuck end to table	300 mm
	Max. distance from chuck end to base	440 mm
	Machine height	980 mm
	Colomn diameter	ϕ80 mm
	Weight	80 kg
	Motor	three phase, 400V, 4P, 300W

2. High speed drilling machine 1 unit

Type:	NBD 250	
Specification:	Drilling ability	ϕ10 mm, with chuck
	Swing	275 mm
	Number of revolution of main spindle	1,200, 2,600, 500 rpm
	Main spindle feeding range	80 mm
	Base working space	254 mm x 254 mm
	Base floor space	433 mm x 320 mm
	Taper of spindle	J.T. 2
	Max. distance from chuck end to base	240 mm
	Machine height	660 mm
	Diameter of column	ϕ63.5 mm
	Weight	62 kg
	Motor	three phase, 400V, (2P), 250 W

Spec. No. 16.7.6

3. Radial drilling machine 1 unit

Type:	NRD 540 Floor type	
Specification:	Drilling ability	(Steel) ϕ25 mm
	Distance from center of spindle to column surface	Max. 540 mm Min. 285 mm
	Max. distance from end of spindle to base surface	510 mm
	Number of revolution of main spindle (50 Hz)	140, 230, 460, 950, 1,250, 2,200 rpm, 6 speed changes
	Main spindle feeding range	100 mm
	Taper of main spindle hole	M.T. No. 3
	Up and down moving of arm	510 mm
	Left and right moving of arm	250 mm
	Elevation of arm	Manual
	Rotating angle of arm	90° left and right
	Base working area	410 mm x 585 mm
	Base floor area	530 mm x 865 mm
	Machine hight	1,700 mm
	Diameter of column	ϕ127 mm
	Motor	three phase, 400V, 4P, 750 W
	Weight	650 kg

Accessaries:

1) Drill sleeve	
MT 1 x 3, In MT 1 out MT 3	1 pc.
MT 2 x 3, In MT 2 out MT 3	1 pc.
Cotter	1 pc.
2) Arbor for drill chuck	
2.1/2 x 3(T.2.1/2 x M.T.3) with tang	1 pc.
3) Drill chuck 13 (drilling ability ϕ13 mm), with chuck handle and drift	1 pc.
4) Mass block	1 pc.

S-16

Spec. No. 16.7.7
Universal Milling Machine

1. Purpose of Application:
   To be used at Central Telecmmunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 stand

3. Specification: (Construction dimensions, electrical requirement and mechanical requirement etc.)

Type:	SPU-CH	
Specification:	Size of table area	1,100 mm x 280 mm
	Longitudinal travel	650 mm
	Cross travel	300 mm
	Vertical travel	400 mm
	Longitudinal feed speed	13-600 mm/min. Rapid 2,500 mm/min.
	Vertical rapid feed speed	665 mm/min.
	Swivel, right and left respectively	45°
	Main spindle	Speed range, 90 – 1,400 rpm Nose taper NST 40
	Distance from spindle center to table surface	20 – 420 mm
	Distance from spindle center to overarm	125 mm
	Motor	Main spindle 7.5 kW Table longitudinal feed 0.75 kW Table vertical rapid feed 0.6 kW Coolant pump 100 W Input 3 phase 400V
	Net weight	2,100 kg
Standard Accessaries	Arbor with collars	1 set
	Arbor drawing bolt	1 set
	Levelling bolts	4
	Tools	1 set
	Tool box	1

Spec. No. 16.7.7

	Instruction manual (by latter item No. 5)	
	Accuracy test certificate	1 set
Special Accessaries	Vertical attachment with arm and drawing bolt	1 set
	Specification	
	Max. destance from spindle nose to table surface	300 mm
	Distance from spindle center to colum surface	300 mm
	Spindle nose taper	NST 40
	Milling arbor	7/8", 1", 1½"
	Cutter arbors	Suitable for SPU-CH
	Sockets	
	Lighting attachment	
	Universal index head	
	Rotary table	

Notes:

1. A name plate, on which name of item, date manufactured, serial number and name of manufacturing company are described in English, is attached to panel, metal casing or cover.
   All the other descriptions on panel are to be described in English.
2. Anything but the specified in this specification is to be subject to JIS.
3. Manufacturer Nominated SHIZUOKA MACHINE TOOL Co.

4. Accessaries and Spare Parts:
   As listed on the above.

5. Materials to be submitted:

Operational instruction manual	(English)	(5 copies)
Operational instruction manual	(Japanese)	(3 copies)
Test resulting sheet		(3 copies)
Catalogue		(3 copies)
Invoice		(4 copies)

Spec. No. 16.7.7

Packing list (4 copies)
(One each of them is attached to the equipment)

6. Remarks:
Accessaries are to be put in few case, which "For Universal Milling Machine" are to be described.

S-16

Spec. No. 16.7.8
Electric Bench Grinders

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad. to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 set

3. Specification: (Construction dimensions,eelectrical requirement and mechanical requirement etc.)

1. Electric floor grinder 1 unit

Type:	GBT5 type	
Specification:	Diameter of grinding wheel	ϕ205 mm
	Power source	400V, three phase, 2P motor, 600 W, 3,000 rpm (50 Hz)
Accessary:	Code (with connecting plug)	
	Spark breaker adjustment plate	1 set
	Floor stand (suitable for GBT5 in accordance with FS type)	1 pc.
	Eye shield for bench grinder (for GBT5)	1 pc.
	Water receiving (for GBT5)	1 pc.
	Grinding wheel, ϕ205 mm x width 19 mm A36 N.V. flat	4 pcs.
	Wrench for replacing grinding wheel	1 pc.

2. Electric bench grinder 1 unit

Type:	EBT-2 type	
Specification:	*Dimension of grinding wheel for*	ϕ150 mm
	Power source	Three phase 400V
	Motor	300 W 3,000 rpm (50 Hz)
Accessaries:	Code (with connecting plug)	
	Spark breaker adjustment plate	1 set

Spec. No. 16.7.8

		Eye shield for bench grinder (EBT-2)	
		Grinding wheel	Outside ϕ150 mm x inner ϕ12.7 mm x width 16 mm, WA46LV flat 3 pcs. A36NV flat 3 pcs.
		Wrench, for replacing grinding wheel	1 pc.
3.	Electric buffer	1 unit	
	Type:	400 type	
	Specification	Fitting buff	ϕ240 mm x thickness 30 mm
		Power source	Three phase 400V
		Motor	400 W 2P (50 Hz) 3,000 rpm
	Accessaries:	Power source code (with connecting plug)	
		Buff ϕ250 mm x thickness 30 mm	4 pcs.
		ϕ200 mm x thickness 30 mm	4 pcs.
		Wrench (for replacing buff)	1 pc.
4.	Tool post grinder	1 unit	
	Type:	CLH type	
	Specification:	Grinding wheel to be used:	In outside grinding work; outside ϕ65 mm x width 6 mm x inner ϕ12.0 mm In hole grinding work; outside ϕ9.5 mm x width 9.5 mm x inner ϕ3.5 mm
		Power source	Single phase 230V
		Motor	14,000 rpm 325 W use for lathe installation
	Accessaries:	Standard	
		Short extension (with grinding wheel)	1 pc.
		Grinding wheel	1 pc.

Spec. No. 16.7.8

wrench	1 pc.
Special	
Grinding wheel	Outside ϕ65 mm x width 6 mm x inner ϕ12.0 mm A46Q 10 pcs. Outside ϕ9.5 mm x width 9.5 mm x inner ϕ3.5 mm 36L 10 pcs.

Notes:

1. A name plate, on which name of item, date manufactured, serial number and name of manufacturing company are described in English, is attached to panel, metal casing or cover.
   All the other descriptions on panel are to be described in English.
2. Anything but the specified in this specification is to be subject to JIS.
3. Manufacturer Nominated, Shinchi Shoten K.K.

4. Accessaries and Spare Parts:
   As listed on the above:

5. Materials to be submitted:

Operational instruction manual	(English)	(5 copies)
Operational instruction manual	(Japanese)	(3 copies)
Test resulting sheet		(3 copies)
Catalogue		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

   (One each of them is attached to the equipment)

6. Remarks:
   Accessaries and spare parts are to be packed in wooden box, and their usages are to be described on the outside of box.

Spec. No. 16.8

Electric Furnace

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 unit

3. Specification: (Construction dimensions, electrical requirement and mechanical requirement etc.)

Type:	J-340-HT type	
Specification:	Dimensions of the inside of furnace:	300 mm(W) x 300 mm(H) x 440 mm(D) Front open-door type
	Max. temperature to be used	1,200°C
	Normal temperature	1,000°C
	Electric watt:	9 kW
	Power source	Single phase 230V
	Heating unit:	Kanthal A-1
	Temperature control	Automatic temperature control is to be made within ±10°C against arbitrary temperature established. The time of fixed temperature can be set by timer setting through buzzer alarming when attained to the temperature established. Timer's specification is possible. Max. 24 Hrs.
	With electric current, volt-meter and indication lamp	

Notes: 1. A name plate, on which name of item, date manufactured, serial number and name of manufacturing company are described in English, is attached to panel, metal casing or cover.
All the other descriptions on panel are to be described in English.
2. Painting color is to be of manufacturer's standard.
3. Manufacturer Nominated, Yamada Denki K.K.

Spec. No. 16.8

4. Materials to be submitted:

Operational instruction manual	(English)	(5 copies)
Operational instruction manual	(Japanese)	(3 copies)
Test resulting sheet		(3 copies)
Catalogue		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One each of them is attached to the equipment)

S-16

Spec. No. 16.9.1
Screws

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and Islamic Republic of Pakistan.

2. Quantity: 1 set

3. Specification: (Construction dimensions, electrical requirement and mechanical requirement etc.)
Quality and shape are to be subject to JIS.

Item		Specification	Quantity	Remarks
1. Hexagon socket head cap screw	Iron	M5 x 0.8 x 12	1 gross	
Hexagon socket head cap screw	Iron	M5 x 0.8 x 16	1 gross	
Hexagon socket head cap screw	Iron	M5 x 0.8 x 32	1 gross	
Hexagon socket head cap screw	Iron	M6 x20	1 gross	
Hexagon socket head cap screw	Iron	M6 x 32	1 gross	
Hexagon socket head cap screw	Iron	M6 x 50	1 gross	
Hexagon socket head cap screw	Iron	M6 x 40	1 gross	
Hexagon socket head cap screw	Iron	M8 x 80	1 gross	
Hexagon socket head cap screw	Iron	M10 x 50	1 gross	
Hexagon socket head cap screw	Iron	M10 x 100	1 gross	
2. Hexagon head bolt	Steel	M6 x 50	2 gross	

Spec. No. 16.9.1

	Item	Specification		Quantity	Remarks
	Hexagon head bolt	Steel	M8 x 60	2 gross	
	Hexagon head bolt	Steel	M10 x 70	2 gross	
3.	Pan head machine screw	Steel	M3 x 0.5 x 10	5 gross	with cross recess
	Pan head machine screw	Steel	M3 x 0.5 x 20	5 gross	with cross recess
	Pan head machine screw	Steel	M3 x 0.5 x 30	5 gross	with cross recess
	Pan head machine screw	Steel	M4 x 0.7 x 12	5 gross	with cross recess
	Pan head machine screw	Steel	M4 x 0.7 x 20	5 gross	with cross recess
	Pan head machine screw	Steel	M4 x 0.7 x 50	3 gross	with cross recess
	Pan head machine screw	Steel	M5 x 0.8 x 30	2 gross	with cross recess
	Pan head machine screw	Steel	M5 x 0.8 x 50	2 gross	with cross recess
	Pan head machine screw	Steel	M6 x 20	1 gross	with cross recess
	Pan head machine screw	Steel	M6 x 32	1 gross	with cross recess
	Pan head machine screw	Steel	M6 x 50	1 gross	with cross recess
	Pan head machine screw	Brass	M3 x 0.5 x 10	5 gross	with cross recess
	Pan head machine screw	Brass	M3 x 0.5 x 20	5 gross	with cross recess
	Pan head machine screw	Brass	M3 x 0.5 x 30	5 gross	with cross recess
	Pan head machine screw	Brass	M4 x 0.7 x 12	5 gross	with cross recess

Spec. No. 16.9.1

	Item		Specification	Quantity	Remarks
	Pan head machine screw	Brass	M4 x 0.7 x 20	5 gross	with cross recess
	Pan head machine screw	Brass	M4 x 0.7 x 50	3 gross	with cross recess
	Pan head machine screw	Brass	M5 x 0.8 x 16	2 gross	with cross recess
	Pan head machine screw	Brass	M5 x 0.8 x 30	2 gross	with cross recess
	Pan head machine screw	Brass	M5 x 0.8 x 50	2 gross	with cross recess
	Pan head machine screw	Brass	M6 x 20	1 gross	with cross recess
	Pan head machine screw	Brass	M6 x 32	1 gross	with cross recess
	Pan head machine screw	Brass	M6 x 50	1 gross	with cross recess
4.	Flat countersunk machine screw	Steel	M3 x 0.5 x 10	5 gross	Nickel, plating with cross recess
	Flat countersunk machine screw	Steel	M3 x 0.5 x 20	5 gross	Nickel plating, with cross recess
	Flat countersunk machine screw	Steel	M3 x 0.5 x 30	5 gross	Nickel plating, with cross recess
	Flat countersunk machine screw	Steel	M4 x 0.7 x 12	5 gross	Nickel plating, with cross recess
	Flat countersunk machine screw	Steel	M4 x 0.7 x 20	5 gross	Nickel plating, with cross recess
	Flat countersunk machine screw	Steel	M4 x 0.7 x 50	3 gross	Nickel plating, with cross recess
	Flat countersunk machine screw	Steel	M6 x 20	1 gross	Nickel plating, with cross recess
	Flat countersunk machine screw	Steel	M6 x 30	2 gross	Nickel plating, with cross recess

Spec. No. 16.9.1

	Item		Specification	Quantity	Remarks
	Flat countersunk machine screw	Steel	M6 x 60	1 gross	Nickel plating, with cross recess
	Flat countersunk machine screw	Brass	M2 x 6	5 gross	with slot
	Flat countersunk machine screw	Brass	M2 x 18	5 gross	with slot
	Flat countersunk machine screw	Brass	M3 x 0.5 x 10	5 gross	with cross recess
	Flat countersunk machine screw	Brass	M3 x 0.5 x 20	5 gross	with cross recess
	Flat countersunk machine screw	Brass	M3 x 0.5 x 30	5 gross	with cross recess
	Flat countersunk machine screw	Brass	M4 x 0.7 x 12	3 gross	with cross recess
	Flat countersunk machine screw	Brass	M4 x 0.7 x 20	3 gross	with cross recess
	Flat countersunk machine screw	Brass	M4 x 0.7 x 50	3 gross	with cross recess
	Flat countersunk machine screw	Brass	M5 x 0.8 x 16	2 gross	with cross recess
	Flat countersunk machine screw	Brass	M5 x 0.8 x 30	2 gross	with cross recess
	Flat countersunk machine screw	Brass	M5 x 0.8 x 50	2 gross	with cross recess
	Flat countersunk machine screw	Brass	M6 x 20	1 gross	with cross recess
	Flat countersunk machine screw	Brass	M6 x 30	1 gross	with cross recess
	Flat countersunk machine screw	Brass	M6 x 50	1 gross	with cross recess
5.	Hezagon nut	Steel	M3 x 0.5	30 gross	
	Hezagon nut	Steel	M4 x 0.7	30 gross	

Spec. No. 16.9.1

	Item	Specification		Quantity	Remarks
	Hexagon nut	Steel	M5 x 0.8	25 gross	with cross recess
	Hexagon nut	Steel	M6	2 gross	with cross recess
	Hexagon nut	Steel	M8	2 gross	with cross recess
	Hexagon nut	Steel	M10	1 gross	with cross recess
	Hexagon nut	Brass	M2	15 gross	with cross recess
	Hexagon nut	Brass	M3 x 0.5	30 gross	with cross recess
	Hexagon nut	Brass	M4 x 0.7	30 gross	with cross recess
	Hexagon nut	Brass	M5 x 0.8	20 gross	with cross recess
	Hexagon nut	Brass	M6	8 gross	with cross recess
	Hexagon nut	Brass	M8	1 gross	with cross recess
	Hexagon nut	Brass	M10	1 gross	with cross recess
6.	Plain washer	Steel	3	100 gross	Small round
	Plain washer	Steel	4	50 gross	Small round
	Plain washer	Steel	5	30 gross	Small round
	Plain washer	Steel	6	4 gross	Small round
	Plain washer	Steel	8	2 gross	Small round
	Plain washer	Steel	10	2 gross	Small round
	Plain washer	Brass	2	20 gross	Burnished round
	Plain washer	Brass	3	100 gross	Burnished round
	Plain washer	Brass	4	50 gross	Burnished round
	Plain washer	Brass	5	30 gross	Burnished round
	Plain washer	Brass	6	10 gross	Burnished round
7.	Spring locks washer	Steel	3	5 gross	No. 2
	Spring locks washer	Steel	4	4 gross	No. 2
	Spring locks washer	Steel	5	3 gross	No. 2
	Spring locks washer	Steel	6	1 gross	No. 2
	Spring locks washer	Steel	8	1 gross	No. 2
	Spring locks washer	Steel	10	1 gross	No. 2
8.	Spring lock washer	Phosphor bronze	3	5 gross	No. 2

Spec. No. 16.9.1

	Item	Specification		Quantity	Remarks
	Spring lock washer	Phosphor bronze	4	4 gross	No. 2
	Spring lock washer	Phosphor bronze	5	3 gross	No. 2
	Spring lock washer	Phosphor bronze	6	1 gross	No. 2
9.	Round head wood screw	Steel	2.7 x 10	10 gross	Zinc plating, with cross recess
	Round head wood screw	Steel	3.1 x 16	10 gross	Zinc plating, with cross recess
	Round head wood screw	Steel	3.8 x 20	20 gross	Zinc plating, with cross recess
	Round head wood screw	Steel	4.5 x 25	20 gross	Zinc plating, with cross recess
	Round head wood screw	Steel	4.8 x 32	10 gross	Zinc plating, with cross recess
10.	Flat countersunk screw screw	Steel	2.7 x 10	10 gross	Zinc plating, with cross recess
	Flat countersunk screw	Steel	3.1 x 16	10 gross	Zinc plating, with cross recess
	Flat countersunk screw	Steel	3.8 x 20	20 gross	Zinc plating, with cross recess
	Flat countersunk screw	Steel	4.5 x 25	20 gross	Zinc plating, with cross recess
	Flat countersunk screw	Steel	4.8 x 32	10 gross	Zinc plating, with cross recess
11.	Round head rivet	Copper	2 x 10	5 gross	Cold forming
	Round head rivet	Copper	3 x 15	5 gross	Cold forming
	Round head river	Aluminum	3 x 15	15 gross	

Spec. No. 16.9.1

Item	Specification		Quantity	Remarks
12. Countersunk head rivet	Cooper	3 x 15	5 gross	Cold forming

Note:

1. A name plate, on which name of item, date manufactured, serial number and name of manufacturing company are described in English, is attached to panel, metal casing or cover.
   All the other descriptions on panel are to be described in English.
2. Anything but the specified in this specification is to be subject to JIS.
3. Manufacturer Nominated: Shinchi Shoten K.K.

4. Materials to be submitted:

Operational instruction manual	(English)	(5 copies)
Operational instruction manual	(Japanese)	(3 copise)
Test resulting sheet		(3 copies)
Catalogue		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One each of them is attached to the equipment)

5. Remarks:
   Contents, names and sizes of screws packed in each box are to be described on outside of box, or tags described them are to be attached.
   (English or JIS codes are available).

S-16

Spec. No. 16.9.2
Metalic Materials

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 set

3. Specification: (Construction dimensions, electrical requiremnt and mechanical requirement etc.)

	Item	Specification	Quantity	Remarks
1.	Cold rolled steel sheet	914 mm x 1,829 mm x 0.5 mm	5 sheets	SPCC
	Cold rolled steel sheet	914 mm x 1,829 mm x 1.0 mm	5 sheets	SPCC
	Cold rolled steel sheet	914 mm x 1,829 mm x 1.6 mm	3 sheets	SPCC
	Cold rolled steel sheet	914 mm x 1,829 mm x 2.0 mm	3 sheets	SPCC
2.	Hot-rolled mild steel sheet	914 mm x 1,829 mm x 6.0 mm	3 sheets	SPHC
	Hot-rolled mild steel sheet	914 mm x 1,829 mm x 12.0 mm	3 sheets	SPHC
3.	Brass sheet	365 mm x 1,200 mm x 0.5 mm	5 sheets	C2600P-2801
	Brass sheet	365 mm x 1,200 mm x 1.0 mm	10 sheets	C2600P-2801
	Brass sheet	365 mm x 1,200 mm x 1.6 mm	5 sheets	C2600P-2801
	Brass sheet	365 mm x 1,200 mm x 2.0 mm	5 sheets	C2600P-2801
	Brass sheet	365 mm x 1,200 mm x 3.0 mm	3 sheets	C2600P-2801
	Brass sheet	365 mm x 1,200 mm x 6.0 mm	2 sheets	C2600P-2801
4.	Copper sheet	365 mm x 1,200 mm x 0.5 mm	5 sheets	C1100P

Spec. No. 16.9.2

	Item	Specification	Quantity	Remarks
	Copper sheet	365 mm x 1,200 mm x 1.0 mm	5 sheets	C1100P
5.	Aluminum sheet	400 mm x 1,200 mm x 0.5 mm	5 sheets	A2017 (17S)P
	Aluminum sheet	400 mm x 1,200 mm x 1.0 mm	5 sheets	A2017 (17S)P
	Aluminum sheet	400 mm x 1,200 mm x 1.6 mm	10 sheets	A2017 (17S)P
	Aluminum sheet	400 mm x 1,200 mm x 2.0 mm	10 sheets	A2017 (17S)P
	Aluminum sheet	400 mm x 1,200 mm x 3.0 mm	5 sheets	A2017 (17S)P
6.	Phosphor bronze sheet for spring	80 mm x 600 mm x 0.2 mm	2 sheets	C5210 PS
	Phosphor bronze sheet for spring	80 mm x 600 mm x 0.3 mm	2 sheets	C5210 PS
7.	Nickel silver sheet for spring	80 mm x 600 mm x 0.1 mm	2 sheets	C7701P
	Nickel silver sheet for spring	80 mm x 600 mm x 0.2 mm	2 sheets	C7701P
	Nickel silver sheet for spring	80 mm x 600 mm x 0.3 mm	2 sheets	C7701P
8.	Cold finished carbon steel bar	ϕ8 mm x 1 m	3 pcs.	SS30-41B
	Cold finished carbon steel bar	ϕ12 mm x 1 m	3 pcs.	SS30-41B
	Cold finished carbon steel bar	ϕ16 mm x 1 m	3 pcs	SS30-41B
	Cold finished carbon steel bar	ϕ22 mm x 1 m	3 pcs.	SS30-41B
	Cold finished carbon steel bar	ϕ32 mm x 1 m	3 pcs.	SS30-41B
	Cold finished carbon steel bar	ϕ55 mm x 1 m	3 pcs.	SS30-41B

Spec. No. 16.9.2

	Item	Specification	Quantity	Remarks
	Cold finished carbon steel bar	ϕ75 mm x 1 m	1 pc.	SS30-41B
	Cold finished carbon steel bar	ϕ110 mm x 1 m	1 pc.	SS30-41B
9.	Carbon tool steel bar	ϕ16 mm x 1 m	1 pc.	SK3-4
	Carbon tool steel bar	ϕ32 mm x 1 m	1 pc.	SK3-4
	Carbon tool steel bar	ϕ35 mm x 1 m	1 pc.	SK3-4
	Carbon tool steel bar	ϕ55 mm x 1 m	1 pc.	SK3-4
10.	Brass bar	ϕ8 mm x 1 m	4 pcs.	C3601-4B
	Brass bar	ϕ12 mm x 1 m	4 pcs.	C3601-4B
	Brass bar	ϕ16 mm x 1 m	4 pcs.	C3601-4B
	Brass bar	ϕ22 mm x 1 m	4 pcs.	C3601-4B
	Brass bar	ϕ32 mm x 1 m	4 pcs.	C3601-4B
	Brass bar	ϕ55 mm x 1 m	2 pcs.	C3601-4B
	Brass bar	ϕ75 mm x 1 m	1 pc.	C3601-4B
	Brass bar	ϕ110 mm x 1 m	1 pc.	C3601-4B
11.	Copper bar	ϕ16 mm x 1 m	1 pc.	C1100B
	Copper bar	ϕ32 mm x 1 m	1 pc.	C1100B
	Copper bar	ϕ55 mm x 0.5 mm	1 pc.	C1100B
12.	Aluminum bar	ϕ12 mm x 1 m	2 pcs.	A2014-17B
	Aluminum bar	ϕ16 mm x 1 m	2 pcs.	A2014-17B
	Aluminum bar	ϕ32 mm x 1 m	1 pc.	A2014-17B
	Aluminum bar	ϕ55 mm x 1 m	1 pc.	A2014-17B
13.	Equal-side angle steel	25 mm x 25 mm x 3 mm x 1.8 m	6 pcs.	SS41-55
	Equal-side angle steel	35 mm x 35 mm x 3 mm x 1.8 m	6 pcs.	SS41-55
	Equal-side angle steel	50 mm x 50 mm x 4 mm x 1.8 m	4 pcs.	SS41-55

S-16

Spec. No. 16.9.2

	Item	Specification	Quantity	Remarks
14.	Equal-side angle brass	10 mm x 10 mm x 2 mm x 1.8 m	6 pcs.	BS
	Equal-side angle brass	15 mm x 15 mm x 3 mm x 1.8 m	6 pcs.	BS
	Equal-side angle brass	25 mm x 25 mm x 3 mm x 1.8 m	4 pcs.	BS
15.	Equal-side angle aluminum	15 mm x 15 mm x 3 mm x 1.8 m	6 pcs.	A2014-17S
	Equal-side angle aluminum	25 mm x 25 mm x 3 mm x 1.8 m	6 pcs.	A2014-17S
	Equal-side angel aluminum	50 mm x 50 mm x 4 mm x 1.8 m	4 pcs.	A2014-17S
16.	Drill rod	ϕ1.0 mm x 1 m	5 pcs	(SK material)
	Drill rod	ϕ2.0 mm x 1 m	5 pcs.	(SK material)
	Drill rod	ϕ3.0 mm x 1 m	5 pcs.	(SK material)
	Drill rod	ϕ4.0 mm x 1 m	5 pcs.	(SK material)
	Drill rod	ϕ5.0 mm x 1 m	5 pcs.	(SK material)
17.	Die plate	SK3, 250 mm x 125 mm x 13 mm Grinding finish on both surface	5 sheet	Die material for press

Quality of each above materials is to be subject to JIS.

Notes:

1. A name plate, on which name of item, date manufactured, serial number and name of manufacturing company are described in English, is attached to panel, metal casing or cover.
   All the other descriptions on panel are to be described in English.
2. Anything but the specified in this specification is to be subject to JIS.
3. Manufacturer Nominated Kato Kinzoku K.K.

Spec. No. 16.9.2

4. Materials to be submitted:

Operational instruction manual	(English)	(5 copies)
Operational instruction manual	(Japanese)	(3 copies)
Test resulting sheet		(3 copies)
Catalogue		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One each of them is attached to the equipment)

5. Remarks:

English and JIS codes are used in every materials and classifications for entering, or tags written by them are to be attached.

Spec. No. 16.9.3
Non-metalic Materials

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 set

3. Specification (Construction dimensions, electrical requirement and mechanical requirement etc.)

	Item	Specification	Quantity	Remarks
1.	Phenol sheet of cross-base	1 m x 1 m x 1.6 mm t	5 sheets	Phenol resin
	Phenol sheet of cross-base	1 m x 1 m x 3.0 mm t	5 sheets	Phenol resin
	Phenol sheet of cross-base	1 m x 1 m x 5.0 mm t	2 sheets	Phenol resin
	Phenol sheet of cross-base	1 m x 1 m x 10 mm t	1 sheet	Phenol resin
2.	Phenol bar of paper base	ϕ6 mm x 1 m	10 pcs.	Phenol resin
	Phenol bar of paper base	ϕ10 mm x 1 m	10 pcs.	Phenol resin
	Phenol bar of paper base	ϕ20 mm x 1 m	10 pcs.	Phenol resin
3.	Acrylate resin sheet	1.1 m x 1.3 m x 2 mm t	3 sheets	
	Acrylate resin sheet	1.1 m x 1.3 m x 5 mm t	2 sheets	
4.	Duracon sheet	300 mm x 1,000 mm x 6 mm t	6 sheets	
	Duracon sheet	300 mm x 1,000 mm x 12 mm t	6 sheets	
5.	Duracon bar	ϕ6 mm x 1 m	5 pcs.	
	Duracon bar	ϕ10 mm x 1 m	5 pcs.	
	Duracon bar	ϕ20 mm x 1 m	3 pcs.	
6.	Phenol pipe	Out diameter ϕ10 x 1.5 mm t x 1 m t	2 pcs.	Phenol resin
7.	Vinyl sheet	1,370 mm x 4 m x 0.2 mm t	10 sheets	P.V.C.

Spec. No. 16.9.3

	Item	Specification	Quantity	Remarks
8.	Vinyl tube	Inn. dia. ϕ6 mm x 20 m	1 pc.	P.V.C.
	Vinyl tube	ϕ8 mm x 30 m	1 pc.	P.V.C.
	Vinyl tube	ϕ10 mm x 40 m	1 pc.	P.V.C.
9.	Rubber tube for gas	Inner diameter ϕ9 mm x 50 m	1 pc.	
10.	Rubber tube for water	Inner diameter ϕ15 mm x 50 m	1 pc.	

Notes:

1. A name plate, on which name of item, date manufactured, serial number and name of manufacturing company are described in English, is attached to panel, metal casing or cover.
   All the other descriptions on panel are to be described in English.
2. Anything but the specified in this specification is to be subject to JIS'
3. Manufacturer Nominated Sato Rubber K.K.

4. Materials to be submitted:

Operational instruction manual	(English)	(5 copies)
Operational instruction manual	(Japanese)	(3 copies)
Test resulting sheet		(3 copies)
Catalogue		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One each of them is attached to the equipment)

5. Remarks:
English and JIS codes are used in every materials and classifications for entering, or tags written by them are attached.

Spec. No. 16.9.4
Parts Cases

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic of Pakistan.

2. Quantity: 1 set

3. Specification: (Construction dimensions, electrical requirement and mechanical requirement, etc.)

		Specification		Quantity
1. Parts cabinet	Type:	BANRACK case A38 type		3 pcs.
	Size	416 mm x 310 mm x 522 mm		
	3 rows 8 stairs with A1 type drawers			
	ABS resin made			
	Partition - 75 sheets additional accessaries			
2. Container box	Type	Sekisui container T type (PP)		total 60 pcs.
	Size	T-14 outside dimensions	480 mm x 380 mm x 103 mm	15 pcs.
		T-28	480 mm x 380 mm x 203 mm	15 pcs.
		T-40	480 mm x 380 mm x 303 mm	15 pcs.
	Accessaries	TF type cover for the above listed container case Gray color		15 pcs.

Notes:

1. A name plate, on which name of item, date manufacture, serial number and name of manufacturing company are described in English is attached to panel, metal casing or cover. All the other descriptions on panel are to be described in English.

Spec. No. 16.9.4

2. Manufacturer Nominated, Shinchi Shoten K.K.

4. Accessaries and Spare Parts:
As listed on the above.

5. Materials to be submitted:

Operational instruction manual	(English)	(5 copies)
Operational instruction manual	(Japanese)	(5 copies)
Test resulting sheet		(3 copies)
Test resulting sheet		(3 copies)
Catalogue		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One each of them is attached to the equipment)

Spec. No. 16.10
Carrying Implements

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 set

3. Specification: (Construction dimensions, electrical requirement and mechanical requirement etc.)

   1. Chain block

Type:	"ELEPHANT" mark L70 type L-15	1 pc.
Specification:	Lifting weight	1.5 ton
	Lift:	2.5 m
	The shortest distance between hooks:	400 mm
	Tare	21.5 kg

   2. Hand truck

Type:	TDH type OH-2	
	Loading weight	400 kg
	Iron made	
	Side handling four wheel car	
	Free wheel	B.O. ϕ130 mm
	Fixed wheel	B ϕ180 mm
	600 mm x 900 mm all iron-made floor, affixing iron sheet	

Notes:

1. A name plate, on which name of item, date manufactured, serial number and name of manufacturing company are described in English, is attached to panel, metal casing or cover.
   All the other descriptions on panel are to be described in English.
2. Painting color is to be of manufacturer's standard.
3. Manufacturer Nominated, Shinchi Shoten K.K.

Spec. No. 16.10

4. Materials to be submitted:

Operational instruction manual	(English)	(5 copies)
Operational instruction manual	(Japanese)	(3 copies)
Test resulting sheet		(3 copies)
Catalogue		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One each of them is attached to the equipment)

S-16

Spec. No. 16.11.1
Miscellaneous Tools

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 set

3. Specification: (Construction dimensions, electrical requirement and mechanical requirement etc.)

Item	Specification			Quantity
1. Oiler	Plastic made	Super type	180 cc	3 pcs.
Oiler	Plastic made	Bellmouth type	200 cc	5 pcs.
2. Grease gun	Push type 100 cc	Full length	305 mm	1 pc.
3. Scraper	Bamboo grass type	250 mm		2 pcs.
Scraper	Flat type	200 mm		2 pcs.
4. Scriber	Backed marking-off	(quenching item)		2 pcs.
5. Pin set	AA type			5 pcs.
Pin set	GG type			5 pcs.
Pin set	J type			5 pcs.
Pin set	T type			5 pcs.
Pin set	Regular type for typing			5 pcs.
Pin set	Small type for typing			5 pcs.
6. Oil-stone:	White stone 100 mm x 25 mm x 13 mm			2 pcs.
	Square, smooth cut 100 mm x 25 mm x 13 mm			2 pcs.
	Square, GC 100 mm x 25 mm x 13 mm			2 pcs.
7. Blue paint	Brush painting type, for marking-off			1 pc.

Spec. No. 16.11.1

	Item	Specification		Quantity
		50 mℓ - capacity, supplementary liquid 500 mℓ accessary		
8.	Emery cloth	Sheet	230 mm x 280 mm	total
		#60	100 sheets	300 sheets
		#150	100 sheets	
		#320	100 sheets	
9.	Adhesives	Sony bond epoxide	(8 mℓ + 8 mℓ)/pcs.	50 pcs.
		Sony bond tough	50 mℓ/pc.	30 pcs.
10.	Grinding fluid	Noritake cool S-100N	20 ℓ/can	2 cans for grinding
11.	Machine oil	Daphne mechanic #44	20 ℓ/can	7 cans for main spindle & mission part
		Daphne mechanic #35	20 ℓ/can	1 cans for grinder spindle
	Machine oil	Daphne mechanic #52	20 ℓ/can	2 cans for lathe aprons
	Machine oil	Daphne multiway #52	20 ℓ/can	5 cans for sliding part lubrication
12.	Grease	Daphne colonex grease	16 kg/can	1 can

Notes:

1. A name plate, on which name of item, date manufactured, serial number and name of manufacturing company are described in English, is attached to panel, metal casing or cover.
   All the other descriptions on panel are to be described in English.
2. Anything but the specified in this specification is to be subject to JIS.
3. Manufacturer Nominated, Shinchi Shoten K.K.

Spec. No. 16.11.1

4. Materials to be submitted:

Operational instruction manual	(English)	(5 copies)
Operational instruction manual	(Japanese)	(3 copies)
Test resulting sheet		(3 copies)
Catalogue		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One each of them is attached to the equipment)

5. Remarks: Next page

S-16

Spec. No. 16.11.1

Machine Oil: Usage Classification: (Details apply to each machine operational instruction manual)

1. For Lathe (LPT-35)

Operation has to be made by feeding main parts of machine with the following oils.
All of them are to be replaced within 3 to 6 months' operation after oils were put at the begining.
(actual operation hours: about 300 hours)
Thereafter, the oils are to be replaced in every a half year to one year. (It seems to be good to replace them longer than that according to working conditions.)

1.	Main spindle part	Daphne mechanic #44	7.5 ℓ
2.	Variable speed gear part	Daphne mechanic #44	3.5 ℓ
3.	Feed shaft box	Daphne mechanic #52	4 ℓ
4.	Apron. others	Daphne mechanic #52	1.4 ℓ (supply according to working conditions)
5.	Sliding part such as cross guides:	Daphen multiway #52	0.4 ℓ (supply according to working conditions)

2. For Milling Machine (SPU-CH)

Oil changes are to be made in the same cycle with lathe. (The first time change is to be made at 300 hours of actual working.)

1.	Main spindle part:	Daphne mechanic #44	15 ℓ
2.	Variable speed gear part:	Daphne mechanic #44	1.6 ℓ
3.	Sliding part:	Daphne multiway #52	1.5 ℓ (supply according to working conditions) (every morning and evening, small quantity less than 0.1)

Spec. No. 16.11.1

3. For Grinding Machine (NSG315)
Oil changes are to be the same as Lathe.

1.	Spindle part:	Daphne mechanic #35 Mixture with 30% of Daphne multiway #52	0.5 ℓ (supply according to working conditions)
2.	Sliding part:	Daphne multiway #52	0.1 ℓ (supply according to working)

S-16

Spec. No. 16.11.2

Hardness Tester

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 set

3. Specification: (Construction dimensions, electrical requirement and mechanical requirements, etc.)

Type:	MODEL PHT
Graduation:	Vicker's Hardness, 40 – 1,000 Rockwell C Hardness, 20 – 70
Load:	10 kg
Size:	130 mm(W) x 130 mm(L) x 270 mm(H)
Net weight:	4.6 kg (with holder)
Accessaries:	1) Standard accessaries Holder, Flat anvil, Indicater ajust tool, Screw driver 2, Standard test piece, Vinyle cover, Case box 2) Special accessary Press hand grip 1

Notes:

1. A name plate, on which name of item, date manufactured, serial number and name of manufacturing company are described in English, is attached to panel, metal casing or cover.
   All the other descriptions on panel are to be described in English.
2. Anything but the specified in this specification is to be subject to JIS.
3. Manufacturer Nominated, AKASHI

4. Accessaries and Spare Parts:
   As listed on the above.

5. Materials to be submitted:
   Operational instruction manual (English) (5 copies)

Spec. No. 16.11.2

Operational instruction manual	(Japanese)	(3 copies)
Test resulting sheet		(3 copies)
Catalogue		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One each of them is attached to the equipment)

6. Remarks:
Accessaries are to be put in one case, which "FOR HARDNESS TESTER" are to be described.

Section 17 ADMINISTRATION

Spec. No.	SPECIFICATIONS
17.1	Offset Copier
17.2.1	Copier for Ordinary Paper
17.2.2	Large-size Copier
17.3	Slide Projector 35 mm
17.4	Slide Projector with Tape Recorder
17.7	Motor Wagon
17.8	Desk-type Minicomputer
17.9	Overhead Projector
17.10	Pocket-size Calculator
17.11.1	Drafting Machine
17.11.2	Drawing Table and Drawing chair
17.11.3	Drawing Storage Cabinet
17.11.4	Equipment for Drawing Section
17.12	Tape Recorder for Steno
17.15.1	Camera for Microfilm
17.15.2	Microfilm Reader
17.15.3	Printer
17.15.4	Paper (A4) (250 M Roll)
17.15.5	Micrfilm Cabinet
17.15.6	Microfilming Equipment with Accessaries

S-17

Spec. No. 17.1
Offset Copier

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1

3. Specifications: (Structural dimensions, electric conditions, mechanical requirements, etc.)
This article is a floor-type offset copier.

3.1 Construction

Dimensions:	71 cm(W) x 114 cm(D) x 132 cm(H)
Weight:	265 kg

3.2 Capacity

Printing speed:	2,000 – 9,000 sheets/hour
Area of sheets supplied:	7.6 cm x 12.7 cm - 27.9 cm x 43.2 cm
Max. print area:	24.1 cm x 33.0 cm

3.3 Power source used
220V, 50 Hz

Notes:

1. A nameplate shall be written in English and fixed on the panel, metal case or cover, indicating the name of article, date of manufacture, serial No. and manufacturer's name. All items on the panel shall be indicated in English.
2. Painting color is to be of manufacturer's standard.
3. Unless otherwise designated in the specifications, the offset copier shall comply with the JIS Standards.
4. Designated manufacturer: A.B. Dick Co., Model 350

4. Accessories and Spares:

Cylinder cleaner (473 cc)	2 pcs.
Roller repair liquid (473 cc)	2 pcs.

Spec. No. 17.1

Ink (3-1010, 0.45 kg)	5 cans
Ink (3-1012)	2 cans

5. Submittals:

The following shall be submitted in the number of copies specified below

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to the equipment)

S-17

Spec. No. 17.2.1
Copier for Ordinary Paper

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be installed under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1

3. Specification: (Structural dimensions, electric conditions, mechanical requirements, etc.)

3.1 Structural dimensions
960 mm(W) x 850 mm(H) x 607 mm(D)
Approx. 150 kg, Console type

3.2 Functional requirements

Max. original copying paper:	B-4 (275 mm x 364 mm)
Copying ratio:	1 : 1
Copying speed:	13 sheets/min.
Paper feed:	Automatic
Exposure method:	Movable light source method
Exposure control:	Light quantity control

3.3 Electrical requirements

Lamp used:	Halogen lamp
Power source:	230V, 50 Hz

Notes:

1. A nameplate shall be written in English and fixed on the panel, metal case or cover, indicating the name of article, date of manufacture, serial No. and manufacturer's name. All items on the panel shall be indicated in English.
2. Painting color is to be of manufacturer's standard.
3. Unless otherwise designated in the specifications, the copier for ordinary paper shall comply with the JIS Standards.
4. Designated manufacturer: Konishiroku Photo Industry Co., Ltd. U-Bix 750

Spec. No. 17.2.1

4. Submittals:

The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment)

S-17

Spec. No. 17.2.2
Large-Scale Copier

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be installed under an agreement between the government of Japan and the islamic Republic of Pakistan.

2. Quantity: 1

3. Specifications: (Structural dimensions, electric conditions, mechanical requirements, etc.)

3.1 Construction

Dimensions:	1,490 mm(W) x 1,030 mm(D) x 1,385 mm(H) (including a special-purpose desk and developing tank)
Weight:	Approx. 270 kg (main body)

3.2 Specifications

Copying width:	1,100 mm
Developing method:	Dry type (gas circulation method)
Paper feed speed:	30 - 330 m/h
Light source:	High voltage mercury lamp
Power consumption:	3.7 kW (AC 230V)

Notes:

1. A nameplate shall be written in English and fixed on the panel, metal case or cover, indicating the name of article, date of manufacture, serial No. and manufacturer's name. All items on the panel shall be indicated in English.
2. Painting color is to be of manufacturer's standard.
3. Items other than those designated in this specification must comply with catalog specifications.
4. Designated manufacturer: Ricoh Co., Ltd. Ricopy AC-2,000

4. Accessories and Spares:

Mercury lamps	3 pcs.
Al-size sensitive paper	500 sheets
One roll	100 m x 880 mm

Spec. No. 17.2.2

5. Submittals:

The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each equipment)

S-17

Spec. No. 17.3
Slide Projector 35 mm

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be installed under an agreement between the government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1

3. Specifications: (Structural dimensions, electric conditions, mechanical requirements, etc.)

3.1 Dimensions and weight
277 mm x 382 mm x 248 mm, 12 kg (main body)

3.2 Specifications

Slide	2 x 2 slide picture size; less than 23 mm x 35 mm
Tray	Straight advance tray (accommodating 50 sheets), circular tray (accommodating 120 sheets)
Power source:	AC 230V, 50 Hz
Power consumption:	360 W
Projection lamp:	24V, 250 W halogen lamp
Projection lens:	F2.8, f = 140 mm
Feed operation:	Both direct operation and operation by remote control are possible.

Notes:

1. A nameplate shall be written in English and fixed on the panel, metal case or cover, indicating the name of article, date of manufacture, serial No. and manufacturer's name. All items on the panel shall be indicated in English.
2. Painting color is to be of manufacturer's standard.
3. Items other than those designated in this specification must comply with the JIS Standards.
4. Recommended manufacturer ELMO Co., Ltd. Type AS-3,000A

4. Accessories and Spares:
Spare halogen lamps 3 pcs.

Spec. No. 17.3

5. Submittals:

The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment)

S-17

Spec. No. 17.4

Slide Projector with Tape Recorder

1. *Purpose of Application:*
To be used at Central Telecommunication Research Laboratories, Islamabad, to be installed under an agreement between the government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1

3. Specifications: (Structural dimensions, electric conditions, mechanical requirements, etc.)
This article is a slide projector which incorporates a cassette tape recorder, synchronization of picture and sound and is capable of a continuous supply of slides.

3.1 Dimensions and weight:
450 mm(H) x 380 mm(W) x 360 mm(D), 16.9 kg

3.2 Specifications

Film used:	35 mm full size
Magazine used:	27 – 45 frames
Frame feed:	By signal from tape and manual feed
Screen:	240 mm x 340 mm
Tape used:	Cassette tape C-30
Amplifier:	Max. output 2 W
Speaker:	12 cm dynamic speaker
Power source:	AC 100V, 50 Hz

Notes:

1. A nameplate shall be written in English and fixed on the panel, metal case or cover, indicating the name of article, date of manufacture, serial No. and manufacturer's name. All items on the panel shall be indicated in English.
2. Painting color is to be of manufacturer's standard.
3. Items other than those designated in this specification must comply with the JIS Standards.
4. Recommended manufacturer Fuji Photo Film Co., Ltd. Model Fuji ML1,000

4. Accessories and Spares:

Spare lamps	3 pcs.

Spec. No. 17.4

5. Submittals:

The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment)

S-17

Spec. No. 17.7
Motor Wagon

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be installed under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1

3. Specifications (Structural dimensions, electric conditions, mechanical requirements, etc.)
This motor wagon is used for electric wave survey of the laboratory and transfers surveyors and material for survey. In addition, it is provided with a compact kitchen set for cooking in the car and is also provided with space for napping. A micro-bus shall be modified for this purpose as described below.

1. A micro-bus with a capacity of 17 persons is used for the body of this wagon (overall length: approx. 5.3 m, width: approx. 2 m, height: approx. 2.5 m).
2. Special equipment are a sink, gas range, closet and fresh water tank (approx. 100 ℓ).
3. Seats are furnished on both sides along the windows and they shall be removed as required.
4. The rough interior layout of the car is shown in Fig. 1 for reference.
5. Others
   i) A bed need not be furnished.
   ii) A roof carrier shall be furnished.
   iii) A possibility shall be reserved for mounting a window-type air conditioner.

Notes:

1. A nameplate shall be written in English and fixed on the panel, metal case or cover, indicating the name of article, date of manufacture, serial No. and manufacturer's name. All items on the panel shall be indicated in English.
2. Painting color is to be of manufacturer's standard.
3. Items other than those specified in this specification must comply with the JIS Standards.
4. Recommended manufacturer: Take Body Co., Ltd.

4. Submittals:
The following shall be submitted in the number of copies specified below.

Spec. No. 17.7

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment)

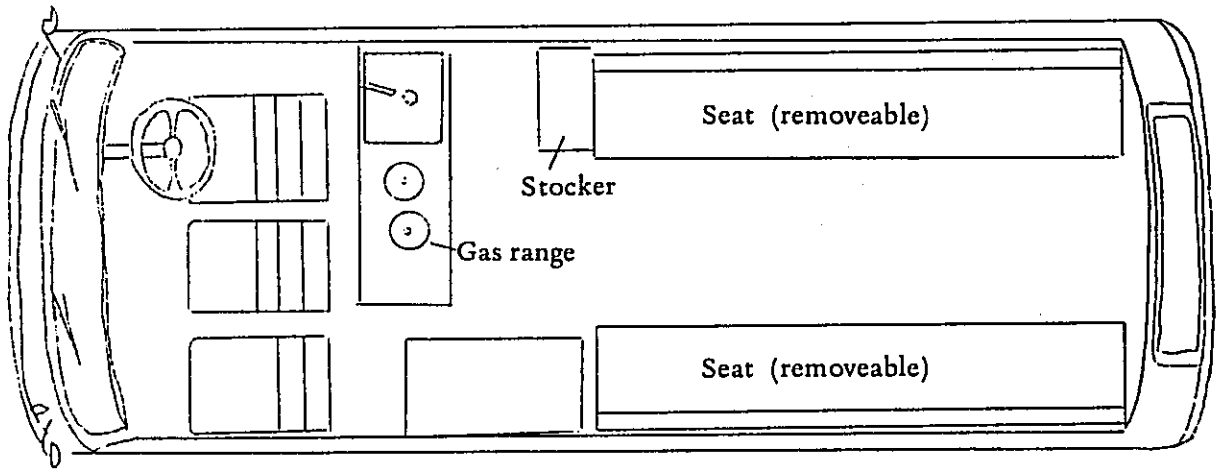


Fig. 1

Spec. No. 17.8
Portable Minicomputer

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be installed under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1.

3. Specifications: (Structural dimensions, electric conditions, mechanical requirements, etc.)

Program memory:	224 steps
Operation range:	$\pm 10^{-99} - 10^{99}$
No. of digits displayed and type:	Mantissa 10 digits, exponent 2 digits, fixed decimal point and floating decimal point
Condition decisions:	14 kinds
Data memories:	31 pcs.
Label designation:	20 kinds
Built-in functions:	32 kinds
A printer is to be built in.	
Power source:	AC 230V and battery

Notes:

1. A nameplate shall be written in English and fixed on the paenl, metal case or cover, indicating the name of article, date of manufacture, serial No. and manufacturer's name. All items on the panel shall be indicated in English.
2. Painting color is to be of manufacturer's standard .
3. Items other than those specified in this specification must comply with the JIS Standards.
4. Designated manufacturer: YOKOGAWA HEWLETT PACKARD Model: YUP97

4. Submittals:
   The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)

Spec. No. 17.8

Invoice	(4 copies)
Packing list	(4 copies)

(One copy shall be attached to each piece of equipment)

S-17

Spec. No. 17.9
Overhead Projector

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be installed under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1

3. Specifications: (Structural dimensions, electric conditions, mechanical requirements, etc.)

Stage:	250 mm x 250 mm
Lens:	320 mm (table type)
Dimmer:	100% – 30%, variable
Weight:	Approx. 9 kg
Power source:	220V, 50 Hz

Notes:

1. A nameplate shall be written in English and fixed on the panel, metal case or cover, indicating the name of article, date of manufacture, serial No. and manufacturer's nam name. All items on the panel shall be indicated in English.
2. Painting color is to be of manufacturer's standard.
3. Items other than those specified in this specification must comply with the JIS Standards.
4. Recommended manufacturer: Riso Kagaku Corporation Model: 750

4. Accessories and Spares:

Spare lamps	3 pcs.

5. Submittals:
The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment)

S-17

Spec. No. 17.10
Pocket-Size Calculator

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be installed under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 10

3. Specifications (Structural dimensions, electric conditions, mechanical requirements, etc.)

Programming system:	Magnetic card system
Program function:	127 steps
Operation range:	$9.9999999\ (-9.999999) \times 10^{\pm 99}$
No. of digits	10 digits,
Condition decision:	3 kinds
Built-in functions:	20 kinds
Power source:	Built-in cell, adapter for AC 220V available

Notes:

1. A nameplate shall be written in English and fixed on the panel, metal case or cover, indicating the name of article, date of manufacture, serial No. and manufacturer's name. All items on the panel shall be indicated in English.
2. Painting color is to be of manufacturer's standard.
3. Items other than those specified in the specification must comply with the JIS Standards.
4. Designated manufacturer Casio Computer Co., Ltd. Model PRO fx-1

4. Accessories and Spares:
   Standard accessories and following potional accessories

AC 220V adapter:	10
Magnetic card sets:	20
Program libeary:	10

5. Submittals:
   The following shall be submitted in the number of copies specified below.
   Instruction manual (English) (5 copies)

Spec. No. 17.10

Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment)

S-17

Spec. No. 17.11.1
Drafting Machine

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be installed under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 5

3. Specifications: (Structural dimensions, electirc conditions, mechanical requirements, etc.)
The drafting machines shall be of the following two kinds.

	A	B
Vertical rail	1,110 mm	1,110 mm
Horizontal rail	1,425 mm	1,900 mm
Drafting range	850 mm x 1,183 mm	850 mm x 1,660 mm
Scale	400 mm x 250 mm	400 mm x 250 mm
Protractor dia.	104 mm	104 mm
Protractor min. reading	10'	10'
Angle automatic setting	Entire circumference divided at intervals of 15°	Entire circumference divided at intervals of 15°
Quantity	4 units	1 unit

Notes:

1. A nameplate shall be written in English and fixed on the panel, metal case or cover, indicating the name of article, date of manufacture, serial No. and manufacturer's name. All items on the panel shall be indicated in English.
2. Painting color is to be of manufacturer's standard.
3. Items other than those specified in the specification must comply with the JIS Standards.
4. Recommended manufacturer Lion D-70 and D-80

4. Accessories and Spares:

Spec. No. 17.11.1

5. Submittals:

The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attched to each piece of equipment)

S-17

Spec. No. 17.11.2
Drawing Table and Drawing Chair

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be installed under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: As specified below

3. Specifications (Approximate specifications)

   3.1 Drawing table
   The drawing tables and chairs shall be of the following two kinds.

	A	B
Applicable drawing board	600 mm x 900 mm – 900 mm x 1,200 mm	900 mm x 1,800 mm – 1,200 mm x 2,400 mm
Floor space occupied	650 mm x 800 mm	1,380 mm x 650 mm
Weight (approx.)	15.5 kg	61 kg
Tilting angle	0° – 85°	0° – 75°
Quantity	3	1

   3.2 Chair

Sitting height	435 mm – 635 mm
Seat size	460 mm – 420 mm
Back	Rocking type
Quantity	4

Notes:

1. A nameplate shall be written in English and fixed on the panel, metal case or cover, indicating the name of article, date of manufacture, serial No. and manufacturer's name. All items on the panel shall be indicated in English.
2. Painting color is to be of manufacturer's standard.
3. Items other than those specified in the specification must comply with the JIS Standards.
4. Recommended manufacturer Lion, Drawing table A-800 and B-20 and chair DC-2

Spec. No. 17.11.2

4. Submittals:

The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment)

S-17

Spec. No. 17.11.3
Drawing Storage Cabinet

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be installed under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1

3. Specifications (Structural dimensions, electric conditions, mechanical requirements, etc.)
The drawing storage cabinets shall be of the following two kinds.

	A	B
Dimensions	415 mm(H) x 978 mm(W) x 740 mm(D)	600 mm(H) x 940 mm(W) x 700 mm(D)
Dimensions of interior of drawer	47 mm(H) x 889 mm(W) x x 656 mm(D)	
Other	Flat-type drawing storage cabinet (with 5-stage drawers)	Desk side roll drawing storage cabinet

Notes:
1. A nameplate shall be written in English and fixed on the panel, metal case or cover, indicating the name of article, date of manufacture, serial No. and manufacturer's name. All items on the panel shall be indicated in English.
2. Painting color is to be of manufacturer's standard.
3. Items other than those specified in the specification must comply with the JIS Standards.
4. Recommended manufacturer Lion, A1-5B, RL-106B

4. Accessories and Spares:
A drawing storage cabinet requiring a stand shall be provided with such.

5. Submittals:
The following shall be submitted in the number of copies specified below.
Instruction manual (English) (5 copies)

Spe. No. 17.11.3

Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies0

(One copy shall be attached to each piece of equipment)

Spec. No. 17.11.4
Equipment for Drawing Section

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be installed under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: As specified on the following table

3. Specifications: (Structural dimensions, electric conditions, mechanical requirements, etc.)
   As specified on the following table

   Notes:
   1. A nameplate shall be written in English and fixed on the panel, metal case or cover, indicating the name of article, date of manufacture, serial No. and manufacturer's name. All items on the panel shall be indicated in English.
   2. Painting color is to be of manufacturer's standard.
   3. Items other than those specified in the specification must comply with the JIS Standards.
   4. Recommended manufacturer FUKUI & CO., LTD. UCHIDA YOKO CO., LTD.

4. Submittals:
   The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment)

Item	*Specifications*	*Quantity*	*Remarks*
1. Drawing board	900 mm x 1,200 mm, 30 mm thick No. 402	3 pcs.	
2. Drawing board	900 mm x 1,800 mm, 30 mm thick	1 pc.	

Item	Specifications	Quantity	Remarks
3. Drawing instrument	English type, 15 pcs. set, 20 items included No. 102 type	4 pcs.	
4. Template	Nos. 1101, 1102, 1111, 1116, 1121, 1131, 1132, 1151, 1171 each one	9 pcs.	
5. Lettering set	12 templates, 11 pens included No. 5001-12L type	4 pcs.	
6. Lettering pen	11 kinds, No. 5031 – No. 5041	11 pcs.	
7. T-square	1,200 mm No. 714 type	4 pcs.	
8. Triangle scale	300 mm, bamboo base, vinyl chloride-coated, metric graduation 1/100-1/600 No. 500 type	4 pcs.	
9. Curve ruler	30-pcs. set, enclosed in a case, No. 373 type 32 pcs. set, enclosed in a case, No. 377 type	1 pc. 1 pc.	
10. Universal curve ruler	Length 700 mm, No. 385 type	1 pc.	
11. Light for drafting	Incandescent lamp Max. extension 1,000 mm, 100 W No. SWL-1001S type	4 pcs.	Colored attachments: Adaptor for drawing bor boardx 4, incandescent lampx4
12. Protractor	No. 252	10 pcs.	
13. Thub tack	Uchida 837-0120	100 box	
14. Feather	Uchida 825-0000	50 pcs.	
15. Brush	No. 450	20 pcs.	
16. Weigh	No. 438	10 pcs.	
17. Pencil core grinder	No. 488	10 pcs.	
18. Oil stone	No. 433	10 pcs.	
19. Paper keys tube		100 pcs.	
20. Side desk	DD-046W	5 pcs.	

S-17

Spec. No. 17.12
Tape Recorder for Steno

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be installed under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 2

3. *Specifications* (*Structural dimensions, electric conditions, mechanical requirements, etc.*)

   3.1 Dimensions and weight
   244 mm(W) x 100 mm(H) x 298 mm(D), 5 kg

   3.2 Electric requirements

Power source used:	220V, 50 Hz
Tape speed:	4.8 cm/sec.
Tape used:	Cassette tapes C-30, C-60, C-90 and C-120
Speaker:	10 cm x 7 cm
Output power:	1 W (Max.)

   Notes:
   1. A nameplate shall be written in English and fixed on the panel, metal case or cover, indicating the name of article, date of manufacture, serial No. and manufacturer's name. All items on the panel shall be indicated in English.
   2. Painting color is to be of manufacturer's standard.
   3. Items other than those specified in the specification must comply with the JIS Standards.
   4. Designated manufacturer Sony, BM-25A

4. Accessories and Spares:

Foot control unit	FS-35
Typewriter control unit	RM-35
Earphone	DE-35
Telephone pick-up	TP-5T

Spec. No. 17.12

5. Submittals:

The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment)

S-17

Spec. No. 17.15.1
Camera for Microfilm

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: One (1) unit

3. Standards: (Constructional dimensions, electrical requirements, and mechanical requirements, etc.)

Type:	Planetary type processor camera
Reduction ratio:	24X
Document size:	258 mm x 366 mm
Film:	16 mm microfilm 30.5 m (100 ft.)
Shooting speed:	1.5 sec./frame
Illumination:	four 60 W incandescent lamps with automatic stabilizer
Developer:	Monobath process with Canon Monomicrol CM-2F/Ready Pack CM-2F
Solution tank capacity:	350 cc
Washing tank capacity:	450 cc x 2
Dryer:	Hot air impingement
Transport speed:	140 mm/min. (5-1/2"/min.) or 1.2 mm/min. (1/2"/min.)
Developing temperature:	30°C (86°F)
Electrical requirements:	240V 50Hz, 440 VA
Dimensions:	562 mm(H) x 860 mm(W) x 657 mm(D) (22-1/8" x 33-7/8" x 25-7/8")
Weight:	30 kg (66 lbs.)

Notes:

1. Name plate, on which name of item, date manufactured, serial number, and name of manufacturer are described in English, is to be attached to the panel or metal casing and cover. All other descriptions on the panel are to be in English.
2. Painting color is to be of manufacturer's standard.
3. Manufacturer Nominated: CANON INC, Model: 161 G

S-17

Spec. No. 17.15.2
Microfilm Reader

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: One (1) unit

3. Standards: (Constructional dimensions, electrical requirements, and mechanical requirements, etc.)

Film:	105 mm x 148.75 mm (4" x 6") microfiche
Screen:	270 mm x 337 mm (10-5/8" x 13-5/8")
Magnification:	23.2X
Focus:	Floating lens system with focus ring
Light source:	Fan cooled 24V 150 W halogen lamp
Power requirements:	240V 50 Hz 155VA
Dimensions:	Height 450 mm (17-3/4")
	Width 345 mm (13-1/8")
	Depth 308 mm (12-1/8")
Weight:	8 kg (17 lbs. 8ozs.)

Notes:
1. Name plate, on which name of item, date manufactured, serial number, and name of manufacturer are described in English, is to be attached to the panel or metal casing and cover. All other descriptions on the panel are to be in English.
2. Painting color is to be of manufacturer's standard.
3. Manufacturer Nominated: CANON INC., Model: 200W

4. Materials to be submitted:

Operational instruction manuals	(English)	(5 copies)
Operational instruction manuals	(Japanese)	(3 copies)
Test result sheets		(3 copies)
Catalogue		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment)

S-17

Spec. No. 17.15.3
Printer

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: One (1) unit

3. Standards: (Constructional dimensions, electrical requirements, and mechanical requirements, etc.)

Type:	Table-top microfilm reader/printer
Film:	Accepts fiche, jacket and roll films, both positive and negative
Copy size:	A4 or letter size (lengthwise and lateral) B5 or invoice size (lengthwise)
Copying speed:	12 sec. per copy
Multiple copy:	1 to 20 copies, count-down dial
Copying system:	Electrostatic imaging with liquid toner processing
Paper feed:	Automatic with roll paper
Magnification of lenses (optional):	8.1X, 8.8X, 10.5X, 14.4X, 16.7X, 18.2X, 19,8X, 21.4X, 24.2X, 27.8X, 30.6X, 34.2X, 38.7X, 41.0X, 44.5X
Screen:	305 mm x 305 mm (12 x 12 inches) plastic gray-tined screen
Light source:	24V, 150 W halogen lamp
Power source:	AC 220V 50 Hz
Power consumption:	0.2 KVA (Machine only)
Dimensions:	520 mm(W) x 650 mm(D) x 720 mm(H) (20.47 x 25.59 x 28.35 inches) inches)
Weight:	82 kg (180.4 lbs.)

Notes:

1. Name plate, on which name of item, date manufactured, serial number, and name of manufacturer are described in English, is to be attached to the panel or metal casing and cover. All other descriptions on the panel are to be in English.
2. Painting color is to be of manufacturer's standard.
3. Manufacturer Nominated: Minolta Camera Co., Ltd. Model: Minolta RP405

4. Accessories and Spare Parts:

Lens	(Magnification: 20X)	1 pc.
	(Magnification: 24X)	1 pc.
Roll film carrier 1		1 pc.
Fiche film carrier 3		1 pc.
Developing solution (4 ℓ)		25 sets

5. Materials to be submitted:

Operational instruction manuals	(English)	(5 copies)
Operational instruction manuals	(Japanese)	(3 copies)
Test result sheets		(3 copies)
Catalogues		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment)

S-17

Spec. No. 17.15.4
Paper (A4) (250 M Roll)

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 50 boxes

3. Standards: (Construcitonal dimensions, electrical requirements, necessary mechanical requirements, etc.)

   1. This paper is a sensitive paper used for microfilm reader printer Minolta RP405.

   2. Size: One roll paper size is 182 mm x 115 m, and two rolls are packed in one box.

   Note:
   Manufacturer Nominated : Minolta Camera Co., Ltd.

4. Material to be submitted:
   Invoice (4 copies)
   Packing list (4 copies)
   (One copy shall be attached to each piece of equipment)

S-17

Spec. No. 17.5.5
Microfilm Cabinet

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: One (1) unit

3. Standards: (Constructional dimensions, electrical requirements, and mechanical requirements, etc.)

1. Dimensions 902 mm(H) x 583 mm(W) x 620 mm(D)

2. Construction with 4 drawers and 4 casters

Notes:

1. Name plate, on which name of item, date manufactured, serial number, and name of manufacturer are described in English, is to be attached to the panel or metal casing and cover. All other descriptions on the panel are to be in English.
2. Painting color is to be of manufacturer's standard.
3. Manufacturer Nominated: Yaesu Co., Ltd. Model: 30-1214

4. Materials to be submitted:

Operational instruction manuals	(English)	(5 copies)
Operational instruction manuals	(Japanese)	(3 copies)
Test result sheets		(3 copies)
Catalogues		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment.)

S-17

Spec. No. 17.15.6
Microfilming Equipment with Accessories

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: One (1) unit

3. Standards: (Constructional dimensions, electrical requirements, and mechanical requirements, etc.)

   1. This equipment is used for selecting microfilm juckets through holes punched on the jackets, and with a electro-motive viblator.

   2. Selecting speed: Approx. 300 – 600 sheets/minute

   3. Jacket size applicable: 6" x 8" – 8" x 8"

   4. Hole size applicable: 1/10"

   5. Power source: AC 100V 50 Hz

   Notes:
   1. Name plate, on which name of item, date manufactured, serial number, and name of manufacturer are described in English, is to be attached to the panel or metal casing and cover. All other descriptions on the panel are to be in English.
   2. Painting color is to be of manufacturer's standard.
   3. Manufacturer Nominated: NIPPON CARD CO., LTD. Model: NCK Selecs SPS 811

4. Accessories and Spare Parts:

Micro B35 jacket (100 sets/box) (with protective cover for 16 mm):	6 boxes
15 step punch for pan selecs (1/10"):	2 pcs.

5. Materials to be submitted:
   Operational instruction manuals (English) (5 copies)

Spec. No. 17.15.6

Operational instruction manuals	(Japanese)	(3 copies)
Test result sheets		(3 copies)
Catalogues		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment.)

Section 18 Chemical Lab/Testing Lob

Spec. No.	SPECIFICATIONS
18.1.1	Transistor h Parameter Measuring Set
18.1.2	Transistor Checker
18.1.3	Transistor In-circuit Auto Checker
18.1.4	Transistor f_T Measuring Set
18.1.5	Thyristor-Curve Tracer
18.1.6	Integrated Circuit Tester
18.1.7	Linear IC Tester
18.12	Temperature and Humidity Chamber

S-18

Spec. No. 18.1.1

Transistor h Parameter Measuring Set

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 unit

3. Specifications (Structural dimensions, electric conditions, mechanical requirements, etc.)
This article is a equipment to measure a wide range of h parameters in small to medium size transistors. The main specifications are shown in Table 1.

Table 1

Item	Characteristic		Accuracy
h11	10Ω–100kΩ	Between 10 and 10k	±2%
h21	0.01–1,000	Between 0.9 and 200	±2%
h12	10^{-6}–10^{-1}	Between 5 x 10^{-5} and 10^{-2}	±2%
h22	0.01V–1mV	Between 0.2 and 100μV	±2%
I_{CBO}, I_{CEO}	0–50, 150, 500φμA, 1.5, 5mA 5 ranges		±1.5%
Bias power source	I_E 0–40mA (Max. 50mA)	4 ranges	
	V_C 0–50V	2 ranges	
Measuring frequency	270 Hz		±10%
Signal output	0–1, 10, 100μA, 10V	4 ranges	

3.1 Construction

1) Construciton and dimensions
This article is composed of two housings. The standard dimensions of the two housings are the measuring section is 510 mm(W) x 380 mm(H) x 310 mm(D) and the power source section is 510 mm(W) x 280 mm(H) x 310 mm(D).

2) The terminal of the power source connecting cord is a double-pole plug (working voltage AC 100V) and is about 2 m long.

3.2 *Electrical requirements*

Spec. No. 18.1.1

Stability of power voltage:	AC 100V ±10% 50, 60 Hz
Temperature range:	5 – 35°C

Notes:

1. A nameplate shall be written in English and fixed on the panel, metal case and cover, indicating the name of aricle, date manufacture, serial No. and manufacturer's name. All items on the panel shall be indicated in English.
2. Painting color is to be of manufacturer's standard.
3. Items other than those specified in this specification shall conform to the manufacturer's catalog.
4. Designated manufacturer Kokuyo Denki Kogyo Co. TC-9D type

4. Accessories and Spares:

Fuses and lamps	The quantities of each item x 2 (excluding the quantities mounted to the equipment)

5. Submittals:

The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment.)

S-18

Spec. No. 18.1.2
Transistor Checker

1. Purpose of Application:
To be used at Central Telecommunication Research Laboratories, Islamabad to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 unit

3. Specifications: (Structural dimensions, electric conditions, mechanical requirements, etc.)
This article is used to measure transistor DC current amplification rate h_{FE} and collector breaking current I_{CBO}. The main specifications are shown in Tables 1 and 2.

(1) h_{FE} measurement

Table 1

Item	Characteristic	Accuracy
Measuring range	10–100, 30–300, 100–1,000, 3 ranges	±(3% + 1) of full scale
Collector voltage	0.3, 0.5, 1, 3, 5, 6, 9, 10, 12, 15V	±5% + 50mA
Collector current	50, 100, 200, 500μA, 1, 2, 5, 10, 20, 50, 100, 200, 500mA (collector voltage at 500mA is to be 0.3, 0.5, 1, 3V)	±3%; ±5% at 50μA

(2) I_{CBO} measurement

Table 2

Item	Characteristic	Accuracy
Measuring range	0.002–0.1, 1, 10, 100μA, 1, 10mA, 6 ranges	±3% of the rated value
Bias power source	V_{CBO}–30, 100V, 2 ranges	±(3% + 100mV) of the rated value

3.1 Construction

Spec. No. 18.1.2

(1) Construction and dimensions
This article is accommodated in a housing. The standard dimensions are 400 mm(W) x 150 mm(H) x 200 mm(D).

(2) The power source connecting cord has a 2-pole plug (normal working voltage AC 100V) at its end and is about 2 m long.

3.2 Electrical requirements

Stability	Power voltage	AC 100V ±10%, 50/60 Hz
	Temperature range	5 - 35°C

Notes:

(1) A nameplate shall be written in English and fixed on the panel, metal case and cover, indicating the name of article, date of manufacture, serial No. and manufacturer's name. All items on the panel shall be indicated in English.
(2) Painting color is to be of manufacturer's standard.
(3) Items other than those specified in this specification shall conform to the manufacturer's catalog.
(4) Designated manufacturer Kokuyo Denki Kogyo Co. Type TCB-9B

4. Accessories and Spare Parts:

Fuses and lamps: The quantities of each item x 2 (excluding those mounted in the e equipment)

5. Submittals:

The following shall be submitted in the number of copies specified below:

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment.)

S-18

Spec. No. 18.1.3

Transistor In-circuit Auto Checker

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 unit

3. Specifications: (Structural dimensions, electric conditions, mechanical requirements, etc.)
   This article is used to carry out a completely automatic in-circuit test and an automatic h_{FE} measurement from small to electric power use transistors and diodes. The main specifications are shown in Tables 1 and 2.

   (1) In-circuit test

Table 1

Item	Characteristic	Accuracy
Condition of circuit	In-circuit and out-circuit	
Identifying indication	PNP GOOD, NPN GOOD, OPEN, SHORT or LOW IMPEDANCE, DIODE GOOD	
Circuit impedance	When circuit impedance is in one place and independent, both transistor and diode shall conform to the following specifications. Generally 500Ω or above; germanium power 75Ω or more; germanium low V_{EBO} 1.5 kΩ or more; diode 500Ω or more. When they are connected in several place, the circuit impedance shall be equivalent to that of those connected in parallel in one place.	
Sequence	SINGLE and REPEAT	
Connection	An emitter, base and collector as well as an anode and cathode can be connected optionally.	
Measuring time	Within 3 sec in SINGLE sequence	

Spec. No. 18.1.3

(2) h_{FE} measurement

Table 2

Item	Characteristic	Accuracy
Condition of circuit	Out-circuit	±5% of full scale
Measuring range	5 – 100, 50 – 1,000, 2 ranges, manual change-over	
Bias	2 points of about 3mA 6V and about 20mA 3V	
Polarity change-over	Automatic and manual	
Connection	According to the division of emitter, base and collector	
Measuring time	Automatic: within 6 sec (sending 3 sec and measuring 3 sec); manual: within 3 sec	

3.1 Construction

1) Construction and dimensions
This article is contained in housing. The standard dimensions are approx. 400 mm(W) x 150 mm(H) x 260 mm(D).

2) The power source connecting cord has a 2-pole plug (normal working voltage AC 100V) attached to its terminal and is about 2 m long.

3.2 Electric requirements

Stability	Power voltage	AC 100V ±10% 50/60 Hz
	Temperature range	5 - 35°C

Notes:

1 The nameplate shall be written in English and fixed on the panel, metal case and cover, indicating the name of article, date of manufacture, serial No. and manufacturer's name. All items on the panel shall be indicated in English.
2. Painting color is to be of manufacturer's standard.
3. Items other than those specified in this specification shall conform to the manufacturer's catalog.

Spec. No. 18.1.3

4. Designated manufacturer Kokuyo Denki Kogyo Co. Type TCB-8

4. Accessories and Spare Parts

Fuses and lamps: The quantities of each item x 2
(excluding those mounted in the equipment)

5. Submittals:

The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment.)

S-18

Spec. 18.1.4
Transistor f_T Measuring Set

1. Purpose:of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 unit

3. Specifications: (Structural dimensions, electric conditions, mechanical requirements, etc.)
   This article is used to measure f_T of NPN and PNP type high frequency transistors as well as to directly read f_T and h_{fe} (-12 - +20dB) by changing test units of four different measuring frequencies of a range of 10 - 200MHz. The main specifications are shown in Table 1.

Table 1

Kind	Characteristics	Accuracy
Measuring frequency	10, 30, 100, 300MHz 4 points	5×10^{-4}
Measuring range	10MHz test unit f_T 10, 30, 100MHz h_{fe} -12 – 0, +10, +20dB	 ±5% ±0.5%
	30MHz test unit f_T 30, 100, 300MHz h_{fe} -12 – 0, +10, +20dB	 ±5% ±0.5%
	100MHz test unit f_T 100, 300, 1,000MHz h_{fe} -12 – 0, +10, +20dB	 ±5% ±0.5%
	200MHz test unit f_T 200, 600, 2,000MHz h_{fe} -12 – 0, +10, +20dB	 ±5% ±0.5%
Signal current	Each unit mold, T0-5, T0-18 10μA or below TO-66 20μA or below	
Bias power source	V_{CB} 0 – 10, 30V 2 ranges I_E 0 – 3, 10, 30, 100, 300, 1,000mA 6 ranges	

Spec. No. 18.1.4

3.1 Construction

1) Construction and dimensions
This article is composed of the main body and three kinds of test units.
The standard dimensions are as follows:
Main body: 430 mm(W) x 150 mm(H) x 300 mm(D)
Test unit: 350 mm(W) x 140 mm(H) x 320 mm(D)

2) The power source connecting cord has a 2-pole plug (normal working voltage AC 100V) attached to its terminal and is about 2 m long.

3.2 Electrical requirements

Stability	Power voltage	AC 100V ±10% 50/60 Hz
	Temperature range	5 – 35°C

Notes:

(1) A nameplate shall be written in English and fixed on the panel, metal case and cover, indicating the name of article, date of manufacturer, serial No. and manufacturer's name. All items on the panel shall be indicated in English.
(2) Painting color is to be of manufacturer's standard.
(3) Items other than those specified in this specification shall conform to the manufacturer's catalog.
(4) Designated manufacturer Kokuyo Denki Kogyo Co. Type THB-2010C

4. Accessories and Spare Parts
Fuses and lamps: the quantities of each item x 2 (excluding those mounted in the equipment)

5. Submittals:
The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)

Spec. No. 18.1.4

Invoice	(4 copies)
Packing list	(4 copies)

(One copy shall be attached to each piece of equipment.)

S-18

Spec. No. 18.1.5

Thristor–Curve Tracer

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 unit

3. Specifications (Structural dimensions, electric conditions, mechanical requirements, etc.)
   This article is used to directly trace characteristic curves of thyristors (SCR, TRIAC, SSS, etc.) and diodes. The main specifications are shown in Table 1.

Table 1

Item	Characteristic	Accuracy
Voltage axis	0.1V/div – 200V/div, 11 ranges (peak values)	±3%
Current axis	0.5μA/div – 2,000mA/div, 21 ranges (peak values)	±3%
Circuit residual resistance	10 mΩ or less	excluding the negative resistance range
Circuit leak resistance	1,000MΩ or more	
Sweep power source	0 – 20V, 20A, 0 – 200V, 1A, 0 – 2,000V, 0.1A	
Sweep wave form	Sinusoidal wave (TRIAC and SSS only) and sinusoidal half-wave, 50 or 60 Hz	
Series resistance	0 – 500kΩ, 19 points	
Overcurrent protection	Operates at a current value at the middle of the scale to 8 div ±2 div for each current range; ON/OFF switch is provided.	
Gate power source	0 – 500mA, 5 ranges Voltage 0 – 5V	

3.1 Construction

1) *Construction and dimensions*

Spec. No. 18.1.5

This article is contained in a housing.
The standard dimensions are approx. 320 mm(W) x 390 mm(H) x 450 mm(D)

2) The power source connecting cord has a 2-pole plug (normal working voltage AC 100V) attached to the terminal and is about 2 m long.

3.2 Electrical requirements

Stability	Power voltage	AC 100V ±10% 50/60 Hz
	Temperature range	5 - 35°C

Notes:

(1) A nameplate shall be written in English and fixed on the panel, metal case and cover, indicating the name of article, date of manufacture, serial No. and manufacturer's name. All items on the panel shall be indicated in English.
(2) Painting color is to be of manufacturer's standard.
(3) Items other than those specified in this specification shall conform to the manufacturer's catalog.
(4) Designated manufacturer Kokuyo Denki Kogyo Co. Type SCT-5T

4. Accessories and Spares:

Fuses and lamps: The quantities of each item x 2 (excluding those mounted in the equipment)

5. Submittals:

The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment.)

S-18

Spec. No. 18.1.6

Integrated Circuit Tester

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 unit

3. Specifications (Structural dimensions, electric conditions, mechanical requirements, etc.)
   This article is capable of a functional test of a bipolar type digital IC or C MOS type digital IC with up to 16 pins through GO/NO-GO decision. The main specifications are shown in Table 1.

Table 1

Item	Characteristic
Testing method	By GO/NO-GO decision with the output comparison method between standard sample and test sample
Decision regarding quality	Compares the presence of pulse relative to time of test sample with that of the standard sample and also compares pulse levels with their settings on the panel. Lights the Go lamp for a conforming article and the NO-GO lamp for a non-conforming article.
No. of pins of test sample	16 pins at maximum (a test station is replaced according to shape of test sample to match the number of pins)
Test items	*Functional test and DC check by voltmeter*
Bias power source	Vcc 0 – 15V, continuously variable (output 1 W), 2 ranges (0 – 8V, 7 – 15V)
Input voltage	V_{IH}, V_{IL}, 0 – 15V, continuously variable, 2 ranges (0 – 8V, 0 – 15V)
Input signal	4096 bits at maximum (2n pattern n = 1 – 12)
Deciding point	V_{OH} 0 – 15V, V_{OL} 0 – 3V, continously variable
Voltmeter	Maximum 2s (200μs/bit)
Clock pulse	0 – 15V (interlocked to Vcc), pulse width approx. 10μs

Spec. No. 18.1.6

3.1 Construction

1) Construction and dimensions
This article is contained in a housing.
The standard dimensions are 500 mm(W) x 350 mm(H) x 410 mm(D)

2) The power source connecting cord has a 2-pole plug (normal working voltage AC 100V) and is about 2 m long.

3.2 Electrical requirements

Stability	Power voltage	AC 100V ±10% 50/60 Hz
	Temperature range	5 - 35°C

Notes:

1. A nameplate shall be written in English and fixed on the panel, metal case and cover, indicating the name of article, date of manufacture, serial No. and manufacturer's name. All items on the panel shall be indicated in English.
2. Painting color is to be of manufacturer's standard.
3. Items other than those specified in this specification shall conform to the manufacturer's catalog.
4. Designated manufacturer Kokuyo Denki Kogyo Co. Type SM-0005C

4. Accessories and Spare Parts

Fuses and lamps	The quantities of each item x 2 (excluding those mounted in the equipment)

5. Submittals:

The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment.)

S-18

Spec. No. 18.1.7

Linear IC Tester

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 unit

3. Specifications: (Structural dimensions, electric conditions, mechanical requirements, etc.)
   This article is used to measure an integrated operating amplifier in terms of DC and AC characteristics. The main specifications are shown in Table 1.

Table 1

Item	Characteristic	Accuracy
Input offset voltage (V_{IO})	1 – 100mV	±3%
Input offset current (I_{IO})	0.01 – 10μA	±3%
Input bias current (I_I)	0.01 – 10μA	±3%
Voltage gain (A_V)	60 – 120dB	±1dB
Input impedance (R_I)	1 – 500kΩ	±10%
Output impedance (R_O)	0 – 1kΩ	±5%
Max. output voltage amplitude (Vop-p)	2 – 20V	±5%
Power consumption (P_T)	0 – 360mW	±5%
Bias power source	Vcc 3, 6, 9, 12, 15, 18V V_{EE} -3, -6, -9, -12, -15, -18V	
Indicator	Vcc 0 – 20V, V_{EE} 0 – -20V Icc 0 – 10mA, I_{EE} 0 – -10mA	
Measuring frequency	1 kHz	±10%

3.1 Construction

1) Construction and dimensions
   This article is contained in a housing. The standard dimensions are 505 mm(W) x 206 mm(H) x 645 mm(D)

2) The power source connecting cord has a 2-pole plug (normal working voltage AC 100V) and is about 2 m long.

Spec. No. 18.1.7

3.2 Electrical requirements

Stability	Power voltage	AC 100V ±10% 50/60 Hz
	Temperature range	5 – 35°C

Notes:

(1) A nameplate shall be written in English and fixed on the panel, metal case and cover, indicating the name of article, date of manufacture, serial No. and manufacturer's name. All items on the panel shall be indicated in English.

(2) Painting color is to be of manufacturer's standard.

(3) Items other than those specified in the specification shall conform to the manufacturer's catalog.

(4) Designated manufacturer Kokuyo Denki Kogyo Co. Type SM-0002

4. Accessories and Spare Parts:

Fuses and lamps: The quantities of each item x 2 (excluding those mounted in the equipment

5. Submittals:

The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment.)

S-18

Spec. No. 18.12

Temperature and Humidity Chamber

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the Government of Japan and the Islamic Republic of Pakistan.

2. Quantity: 1 unit

3. Specifications: (Structural dimensions, electric conditions, mechanical requirements, etc.)
   This article is a equipment to practice temperature and humidity tests of components and devices. The main specifications are shown in Table 1.

Table 1

Item	Characteristic
Temperature range	-30°C – 80°C
Humidity range	30% R.H. – 95%R.H.
Inner space	302 cm(W) x 210 cm(H) x 197 cm(D)
Inner material	Stainless-steel (SUS304)
Control accuracy	±0.5°C/3.0%R.H.
Temperature distribution	±1.0°C
Temperature rising time	Within 60 minutes (20°C – 60°C)
Temperature descending time	Within 120 minutes (20°C – -30°C)

3.1 Construction

1) Construction and dimensions
   The standard dimensions of the housing is 365 cm(W) x 230 cm(H) x 210 cm(D).

2) A PID temperature controller and a recorder are prepared.

3.2 Electrical requirements
   Power supply AC 230V, 3ϕ, 13 KVA, 50 Hz

Spec. No. 18.12

Notes:

1. A nameplate shall be written in English and fixed on the panel, metal case and cover, indicating the name of article, date of manufacture, serial No. and man manufacturer's name. All items on the panel shall be indicated in English.
2. Painting color is to be of manufacturer's standard.
3. Items other than those specified in this specification shall conform to the manufacturer's catalog.
4. Designated manufacturer Tabai Seisakusho Co. TBL-3 type

4. Accessories and Spares:
One set of service components

5. Submittals:
The following shall be submitted in the number of copies specified below.

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test certificate		(3 copies)
Catalog		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment.)

Section 19 Common

Spec. No.	SPECIFICATIONS
19.1	Power Source Facilities for Telecommunication Equipment

S-19

Spec. No. 19.1

Power Source Facilities for Communication Equipments

1. Purpose of Application:
   To be used at Central Telecommunication Research Laboratories, Islamabad, to be established under an agreement between the government of Japan and the Islamic Republic of Pakistan.

2. Quantity: Specified below

3. Scope of Work:
   The scope of work under the agreement shall include the manufacture of the facilities, sea transportation, wiring in the power supply room, wiring from the power board of the power supply room to the power boards of specified laboratories, and the supply of wire and power boards.

4. Composition:
   The facilities are used to supply power to the equipments of Laboratories for doing research and experiments on the telecommunication equipments. The composition shall be as follows:

   1. 60V rectifiers
   2. 48V rectifiers
   3. 24V rectifiers
   4. Power board of the power supply room and power boards of the laboratories
   5. Wiring material and construction material

5. Specifications

   5.1 1) 60V, 48V and 24V rectifier equipment shall be able to convert AC voltage of 3ϕ 400V 50 Hz into DC voltage.
   2) The DC power shall be supplied to load through the voltage compensating circuit (silicon diode circuit) while floating or equally charging the batteries.
   3) The rectifying facility shall be composed of several rectifiers and the control panel.
   4) The specifications of each rectifier shall be as follows:

Spec. No. 19.1

Table 1

		60V 200A	48V 200A	24V 300A	Remarks
Rating		Continuous			
Cooling method		Natural cooling			
Ambient temperature		0°C – 50°C			
AC input	No. of phases	3φ			
	Frequency	50 Hz (+5 Hz, -5 Hz)			
	Voltage	400V (+10%, -15%)			
	Tap of primary side	380V, 400V, 415V			
Rectifier 1 unit	Rectifier output current	100A	100A	150A	Rated values
	Max. input current	25A or less	20A or less	15A or less	
	Floating charging voltage	66.7V 2.15V/cell x 31	53.8V 2.15V/cell x 25	25.8V 2.15V/cell x 12	
	Equalized charging voltage	70.0V 2.26V/cell x 31	56.5V 2.26V/cell x 25	27.2V 2.26V/cell x 12	
	Voltage stability	Within ±1.5%	Within ±1.5%	Within ±1.5%	10% – 100% load
	Output current	0 – 100%	0 – 100%	0 – 100%	
	Efficiency	80% or more	80% or more	80% or more	When the input and output are the rated values
Load	Voltage allowable range	57 – 63V	43 – 53V	22.6V, 26.4V	
	Current range	10 – 100%	10 – 100%	10 – 100%	100% is the rating of the equipment.
	Noise voltage	2mV or less	2mV or less	2mV or less	evaluation for 800 Hz
	Ripple voltage	–	–	250mV or less	Peak to peak
	Battery	1,400AH x 31	840AH x 25	2,100AH x 12	Lead acid battery to be supplied by the customer

5.2 External dimensions (approx.)

60V 200A rectifier 2,400 mm(W) x 500 mm(D) x 2,000 mm(H)

48V 200A rectifier Same as above

24V 300A rectifier Same as above

Spec. No. 19.1

5.3 Composition of rectifier equipments

The composition of rectifier equipments shall be as shown in Table 2. Each unit shall be provided with a function that the rectifiers required according to output current are put automatically into parallel operation. One of the rectifiers in each unit is kept as a spare.

Table 2

Composition / Nane of unit	Controller	Rectifier
60V 200A rectifier unit	200A x 1	100A x 3
48V 200A rectifier	200A x 1	100A x 3
24V 300A rectifier	300A x 1	150A x 3

5.4 Wiring system

The laboratories which require wiring from the rectifier room of the ground floor of the main building and the wiring current capacity is shown in table 3.

1) The laboratories' required wiring shall be provided with a power board in a specified position.
2) The capacity of the power boards and the cables shall satisfy the wiring current capacity in table 3.
3. The voltage drop from the power supply to the telecommunication equipments shall be made lower than the value indicated in Fig. 1.

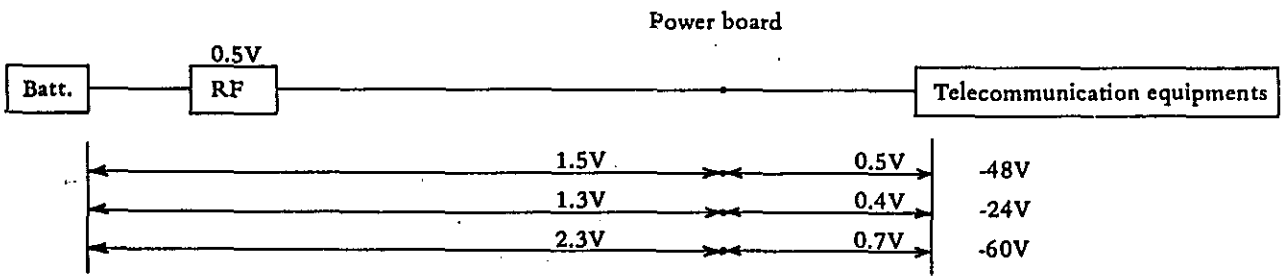


Fig. 1

6. Precautions

6.1 Batteries shall be supplied by the cusomer and need not be provided by the manufacturer. However, wiring work shall be carried out by the manufacturer.

6.2 Sufficient quantities of spare parts shall be provided.

Table 3. Power Distribution and Capacity

	Room	Wiring current capacity		
		60V	48V	24V
Ground floor		–	–	–
1st Floor	Carrier Lab.	50	–	70
	Switching Sys. Lab. (1)	80	120	–
	Switching Sys. Lab. (2)	*10	*10	–
	Telephone Lab.	20	20	–
	Outside Lab.	–	–	–
2nd Floor	Micro Wave Lab.	20	–	160
	VHF. Lab.	–	20	50
	HF. Lab.	20	–	20
3rd Floor	Circuit Component Lab.	–	–	–
	Chemical Lab.	–	–	–
	Telegraph Lab.	10	–	–
	Date Communication Lab.	–	–	–
	Computer Room	–	–	–

*: branched from the switching Sys. Lab. (1)

Notes:

1. A nameplate shall be written in English and fixed on the panel, metal case and cover, indicating the name of article, date of manufacture, serial No. and manufacturer's name. All items on the panel shall be indicated in English.
2. Painting color is to be of manufacturer's standard.
3. Items other than those given in the specifications shall comply with the manufac-

turer's catalogue.

4. Manufacturer (refer to) Shindengen Electric Mfg. Co.

7. Documents to be submitted:

Instruction manual	(English)	(5 copies)
Instruction manual	(Japanese)	(3 copies)
Test results		(3 copies)
Catalogue		(3 copies)
Invoice		(4 copies)
Packing list		(4 copies)

(One copy shall be attached to each piece of equipment.)