

11. 實習室利用狀況

實習室擔當與實習室利用現況

(87. 2學期)

學 部		學 科		備 考 (擔當 實習室)		基礎工作實習室	冷凍空氣調和實習室	材料 試驗室	熱處理 實習室	化學分析實習室	表面處理實習室	COM. 實習室	機電應用實習室	空油壓 實習室	CAD室	機械設計製圖室	金屬設計製圖室	一般工作實習室	金屬加工實習室	精密測定實習室	治工具設計製圖室	金屬加工實習室, 金屬設計製圖室	機械設計製圖室, CAD室	機電應用實習室, Computer實習室	表面處理實習室, 化學分析實習室 熱處理實習室, 材料試驗室 (物理)	冷卻空氣調和實習室 基礎工作實習室	語言實習室							
工 業 部	工 業 科	工業計器科	實習室	工業計器實習室																														
		電子儀器科	實習室	電子儀器實習室																														
		精密測定科	實習室	精密測定實習室																														
		治工具設計科	實習室	治工具設計製圖室																														
		金屬科	實習室	金屬加工實習室																														
		機械設計科	實習室	機械設計製圖室																														
		機電應用科	實習室	機電應用實習室																														
		素材加工科	實習室	表面處理實習室																														
		熱處理科	實習室	熱處理實習室																														
		教授學科	實習室	語言實習室																														
				語言實習室																														

12. 調査団等派遣状況

調査団等 (短期専門家を含む)

名 称	期 間	団 員	担当業務	備 考
先方意向聴取 要請背景調査 団の派遣要請 にもとづき	59.8.2~8.4	外務省技術協力課長		
		JICA海外センター課長		
事前調査団	61.1.31~2.6	谷崎泰明	団長(総括)	外務省技術協力課首席事務官
		五十嵐晃一	施設・設備計画	MOL海外協力課長補佐
		矢追秀敏	協力企画	JICA海外センター課長
		田中清勝	訓練計画(機械)	MOL能開課基準第2係長
		神尾 実	訓練計画(電気電子)	EPC本部職業訓練技術専門校
長期調査団	61.3.24~3.29	小林徳七郎	団長(総括)	MOL能開課民間訓練係長
		田中清勝	機材選定	MOL能開課基準第2係長
		高中克明	"	EPC中央技術開発センター
		更科利夫	"	EPC職業訓練技術センター
		神尾 実	"	EPC本部職業訓練技術専門校
		木邨洗一	協力企画	JICA海外センター課
実地協議調査団	61.4.13~4.19	黒河内久美	団長(総括)	MOL労働大臣官房審議官
		菅間忠男	訓練企画	MOL海外協力課長
		工藤憲一	技術協力	外務省技術協力課長補佐
		矢追秀敏	協力企画	JICA海外センター課長
長期調査員	61.12.8~61.12.20	田中清勝	素材系	
		神尾 実	電子系	
		高中克明	機械系	
		更科利夫	熱管理系	
計画打合せ調査団	61.12.15~12.20	篠崎 斐	総 括	訓練大学校教授
		熊谷茂雄	訓練計画	能開局課長補佐
短期専門家	62.7.26~8.7	鷹野 浩	据 付	横河エンジニアリングサービス(株)
	62.6.23~6.27	長瀬健一	"	ワシノ工機(株)
	62.6.25~7.4	金崎賢治	"	三豊製作所
	7.21~8.1	丸目正高	"	三井ハイテック
	8.10~8.14	朴 光熙	"	インターテクノ(株)(JAP-AX(株))
	8.17~8.18	金 権宰	"	韓国ニューメリック
	62.7.28~8.9	山口文雄	表面処理	大阪総訓校
	8.26.~9.25	白井敏郎	CAD/CAMシステム	日立造船情報システム
	9.16~9.25	岡野正元	空気調和設備	タカギ冷機
長期調査団	62.11.3~11.13	田中清勝	総 括	
		神尾 実	電子系	
		高中克明	機械系	
		更科利夫	熱管理系	
計画打合せ	62.11.7~11.13	五十嵐晃一	総 括	MOL海外協力課長
		千田康規	訓練計画	EPC技術専門役
		佐々木福旺	協力企画	JICA社会開発協力部参事

PART 2

長期調査員チーム報告書

1. 長期調査員チームの派遣目的

昭和61年3月及び同12月企業技能訓練院(ITTI)における機材選定のため長期調査チームが派遣され、第1次及び第2次供与機材の協議を行った。

今回は計画打合せ調査団の派遣に先立ち、昭和63年度導入予定分に対し、また最終年次機材ということで各科の訓練目標達成に必要とされる機材について包括的な検討をするとともに、その仕様、数量等について韓国側関係者と協議検討を行うことを目的として派遣されたものである

2. 長期調査員チームの構成

(1) 総括・素材：田中清勝

雇用促進事業団鳥取技能開発センター所長

(2) 機 械 系：高中克明

労働省職業能力開発局能力開発課

(3) 熱 管 理 系：更科利夫

雇用促進事業団職業訓練研究センター研究員

(4) 電 子 系：神尾 実

雇用促進事業団職業訓練部施設課第1係長

3. 調査日程

日順	月日	曜日	行程	調査内容
1	11/3	火	成田→ソウル 10:00 12:30	<ul style="list-style-type: none"> ・ JL-951 ・ ITTI院長表敬 ・ 視察 ITTI-ITC実習室 (九老区222-13) └ ITC本館 ITI事務棟 (永登浦区大林3洞678-1) ・ 篠崎リーダー、肥土調整員と日程等について打合せ ・ 団内打合せ (於ニュー国際ホテル)
2	11/4	水	ソウル	<ul style="list-style-type: none"> ・ 各科別機材協議 第1次供与機材関係 第3次供与機材基本事項打合せ ・ 金院長とITTIの移転時期等基本的事項協議 ・ 団内打合せ (於コリアナホテル)
3	11/5	木	ソウル	<ul style="list-style-type: none"> ・ 各科別協議 ・ ITTI-ITC実習室レイアウト関係再視察 ・ 篠崎リーダー、肥土調整員と協議進行状況について打合せ ・ 団内打合せ (於コリアナホテル)
4	11/6	金	ソウル	<ul style="list-style-type: none"> ・ 各科別協議 ・ 金院長と空調関係工事について協議
5	11/7	土	ソウル	<ul style="list-style-type: none"> ・ 団内打合せ ・ 計画打合せ調査団との合同会議 (於コリアナホテル)
6	11/8	日	ソウル	<ul style="list-style-type: none"> ・ 機材資料整理及び団内打合せ
7	11/9	月	ソウル	<ul style="list-style-type: none"> ・ 各科別協議 ・ 派遣専門家について協議 ・ 計画打合せ調査団との合同会議 (於コリアナホテル) ・ ミニッツ案検討
8	11/10	火	ソウル	<ul style="list-style-type: none"> ・ 各科別協議 ・ 団内打合せ (於コリアナホテル)
9	11/11	水	ソウル	<ul style="list-style-type: none"> ・ ミニッツ案協議 ・ 供与機材最終チェック-機材リスト (ANNEX) タイプ
10	11/12	木	ソウル	<ul style="list-style-type: none"> ・ ミニッツサイン (於ITTI) ・ 資料整理
11	11/13	金	ソウル→成田 13:50 15:50	<ul style="list-style-type: none"> ・ JL-952

4. 主要面談者

○ ITTI 側

- | | | |
|------|-------|----------|
| (1) | 金 焜 洙 | 企業技術訓練院長 |
| (2) | 陸 榮 澤 | 行政室長 |
| (3) | 鄭 彩 鎬 | 教學部長 |
| (4) | 金 泰 潤 | 教授部長 |
| (5) | 崔 淳 哲 | 工業計器科長 |
| (6) | 金 光 祥 | 電子機器科長 |
| (7) | 林 鐘 太 | 精密測定科長 |
| (8) | 崔 好 善 | 治工具設計科長 |
| (9) | 趙 雄 植 | 金型科長 |
| (10) | 金 源 鎬 | 金型科担当 |
| (11) | 太 聖 吉 | 機械設計科担当 |
| (12) | 李 濯 | 機電應用科長 |
| (13) | 車 永 哲 | 素材加工科長 |
| (14) | 盧 周 錫 | 熱管理科長 |
| (15) | 朴 仁 國 | 教務課長 |
| (16) | 朴 祥 權 | 研究開発課長 |

○ 日側専門家

- | | | |
|-----|---------|---------|
| (1) | 篠 崎 襄 | チームリーダー |
| (2) | 肥 土 和 彦 | 調整員 |

5. 機材選定協議担当者

	日本側	韓国側
総 括	田中清勝	金泰潤
工業計器 電子機器 機電應用	神尾 実	崔淳哲 金光祥 李 濯
熱管理 表面処理	更科利夫	盧周錫 車永哲
油空圧, 機械設 計 金型, 機械工作 精密測定 材料試験	高中克明	太聖吉 趙雄植, 金源鎬 林鐘太 車永哲

6. 第1次供与機材の問題点

第1次供与機材については、すでに納入され ITTI-ITC 本館、及び実習場において各々活用されているところであるが、下記に示す項目について欠品、オプション追加等の要望がなされ長期調査チームとしては、結果欄に示す方向で対処することとした。

科名	項目	要望等	結果
電子機器科	・スペクトラム アナライザ ー アンリツ MS610B	オプション 15種類要望	第2次機材として送付
	・精密板ゼネスコープ 目黒 MSW-745B	Aブロック, Bブロック欠品	日側処理
	・低周波掃引発信機 ケンウッド WG-230	追加要望	第2次機材で送付 目黒MAS 413A
	・デジタル ストレージ オ シロスコープ 岩通 DS-6121	オプションとしてインターフ ェース要望	第2次機材として送付 GP-1B Unit
熱管理科	・クランプ メータ 日置3100	数量2に対し1送付 ※デジタル温度計2→3送付	日側処理
	・両頭グラインダー 日立 GR-26	・ミニッツと仕様書の違い	第2次機材として送付
機電応用科	・ロボット 三菱 RM-501	・オプション追加要望 標準ハンド電動式 接続ケーブル ティーチング ボックス ソフトウェア	第2次機材として送付
精密測定科	・三次元測定機 三豊P604	・ワークショップモデル ・210ソフトウェア	検討結果必要なし
素材加工科	・電解式 膜厚計 ケットS8d5	・標準板, 電解液等	日側処理
	・ピッカーズ硬度計 明石S/S AVK-AII	・欠品 おもりセット 5 釣り環 1	日側処理
金型科	・万能円筒研削盤 シギヤGU-30-40H	・故障	修理済
機械設計科	・CAD/CAMシステム グレードミニII	・オプションとして ベーシック マニュアル及び ソフト要望	第3次機材で検討

7. 専門家の派遣

第2次供与機材（1987年度）の短期派遣専門家については韓国側より①機材の据付及び試運転、②CPへの教育指導で計21名の案がなされたが、協議の結果、機材据付、試運転、教育指導とし計14名とすることで調整をした。

しかし、機材購入後そのメーカーによっては、派遣人数が14名以下となることもあり、韓国側としても了解事項となっている。

派遣時期については、ITTIの夏休みの7月～8月頃がCPへの指導の点で望ましいと考えられるが、機材送付の時期の関係もあり困難であると思われ、機材到着後少なくとも2カ月以内の派遣が必要である。

派遣期間については、CPが充分理解できるよう、できるだけ長期間という現地側の強い要望があり下記のとおりである。

なお機材据付が現地側において可能なものについては備考欄に示すとおりである。

また、今年度派遣予定の表面処理分野における教育指導の派遣専門家については、第2次機材到着後において派遣する方がベターと考え、協議の結果、今年度は見送りとした。

第2次供与機材に関する機材据付、試運転及び教育指導の専門家

科名	専門分野	人数	期間	備考
金型科	・NCワイヤーカット	1	3週間	射出金型設計含む
	・CNCフライス盤	1	3週間	
	・射出成形機	1	6週間	
	・CNC旋盤	1	3週間	
	・万能工具研削盤	1	1週間	
機電応用科	・マイクロプロセッサ デベロップメントシステム	1	7週間	ハード及びソフト設計含む
	・教育ロボットシステム	1	2週間	教育指導のみ 1988年 7～8月頃
	・マイクロコンピュータ、コントロール、センサー、及びアーキテクチャー概論	1	2週間	
素材加工科	・浸炭炉、真空炉、ソルトバス	1	5週間	Set-UP除く
	・ダイナミックアンプリファイヤ、レコーダ及びストレインメータのデータ分析	1	2週間	
	・ウェーザメータ	1	1週間	
	・メッキシステム	1	4週間	
	電気メッキ、化学メッキ			
機械設計科	・油圧、空圧の応用及び設計	1	3週間	教育指導のみ
工業計器科	・温度、圧力、流量、レベル制御（モデルプラント）	1	2週間	Set-UP除く
計		14名	44週間	

8. 第3次供与機材（ミニッツANNEX）

ANNEX

List of Machinery and Equipment
in Japanese FY 1988

- | | |
|--|---------|
| 1. Precision Measuring Laboratory | (90) |
| 2. Machining Shop | (91) |
| 3. Industrial Instruments Laboratory | (92) |
| 4. Electronic Instruments Laboratory | (93) |
| 5. Machinery Design Room | (100) |
| 6. Die and Mold Machining Shop | (101) |
| 7. Air Conditioning Laboratory | (102) |
| 8. Mechatronics Application Laboratory | (104) |
| 9. Heat Treatment Laboratory | (108) |
| 10. Surface Treatment Laboratory | (109) |

Kimura

1. PRECISION MEASURING LABORATORY

No.	Name	Description	Q' ty	others
1	Three coordinate Measuring M/C Accessories	.Interchangeable stylus for TP-1S φ 1.0, 1.5, 2.0, 4.0, 6.0, 8.0 .Taper probe; φ 2- φ 20 .Extension bar φ 14 .Centering microscope 20x .Master ball .Optoeye M1 (detector)	Each 1 1set 1 1 1set 1set	HITUTOYO F-604
2	Electronic Level	Size : 225x 67x 125 Printer Type Capacity : 0.0025mm/m-10mm/m	1set	
3	Height Micrometer	Range : 5-310 Type : Digital display (Built-in rotary encoder) Resolution : 0.001mm Head stroke : 20mm	2set	
4	Square Gauge Block	112pcs/set Grade : 0 class	1set	
5	Square Gauge Block Accessory	25pcs/set Grade : 0 class	1set	
6	Universal Height Micrometer	Range : 5-610 Type : Digital display Resolution : 0.01mm	1set	
7	Long Gauge Block	125mm, 150mm, 175mm, 200mm, 250mm	each 1set	



2. MACHINING SHOP

No.	Name	Description	Q' ty	Others
1	Engine Lathe	Swing over bed 470mm Swing over carriage 240mm Distance between center 800mm Hole through spindle 54mm Spindle speed 50-1,500rpm <u>Optional accessories</u> 1) Steady rest (1) 2) Follower rest (1) 3) Coolant system (2) 4) Live center MT4 (2) 5) Work light (2) 6) Face plate 425mm (2) 7) 4-jaw chuck 12" (2) 8) Chip guard (2)	3	
2	Vertical Milling Machine	Travel Longi. 750mm Gross. 270mm Vertical. 400mm Table size 1,350 x 270mm Spindle taper NST 50 Spindle speed 68- 1,760 rpm <u>Optional accessories</u> 1) Machine vise 200mm (2) 2) Milling chuck set (2) 3) Rotary table 300mm (1) 4) Index head 250mm (1) 5) Work light (2) 6) Digital read out (3-D) (2) 7) Oil pan (2)	2	
3	Drill Grinder	Range ϕ 5- ϕ 50 Point angle 60 - 180 Max. length 400mm <u>Optional Accessories</u> Water coolant system (1) Diamond wheel	1	
4	Gear Hobbing Machine	Gear dia. 660mm Gear pitch M 5 Table dia. 530mm Max. Hob dia. 120mm Hob speed 68-220rpm <u>Optional Accessories</u> Hydraulic support lift (1)	1	

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3. INDUSTRIAL INSTRUMENTS LABORATORY

No	Name	Description	Q'ty	Others
1	Programmable Indicating Controller	SLPC-250-E / SPR / MTS Fluorescent bar graph Programming Chip 5191-501 for SLPC/SPR	3	
2	Programmer	SPRG-000-E for Power Source 100V	1	
3	Indicating Controller	SLCD-250-E/MTS Fluorescent bar graph	3	
4	Operator Station (Operator's Console)	Uops-151-C/EKE/UPRT-210-A/KY/KH/HL English support with Engineer Key Board Printer & HL Bus Terminator	1	
5	Loop Display Unit	ULDU-220-E/MTS Fluorescent bar graph	1	
6	Field Control Unit	UFCH-110-E/LCS-1, Vx1, LCU-1, Vx2, MAC2-1 PX1, PAC-1, ST2, PB5/HL	1	
7	Signal Conditioning Nest & Cards	CNH-A, CNU-A Card: CH1- A, CH5, CT5-TK, CA1, CR5, CA5, CS1 CP1, CH1, CC0, CH2, CA0, CH0, CX1	1	
8	Cables and Others	Accessories for the Above Item No.1 to 7 Software; Pack Software UBPD-101-B(English) x 1 UIND-101-B(English) x 1 UIND-200-B(English) x 1 UBND-101-B(English) x 1 UBND-201-B(English) x 1 Option . UBND -300 x 1 UCVD -100 x 1 Application Software	1	
9	DC Voltage/Current Standard	D-12.000V DC in 4 Range D- 36 A DC in 7 Range MAX. out current 25mA Accuracy output : $\pm 0.005\%$	2	
10	Digital Multimeter	Amps : 1nA -2A Ohms : 100 $\mu\Omega$ -200 K Ω DC Voltage: 1 μ V- 1000V AC Voltage: 10 μ V- 700V	2	



No	Name	Description	Q' ty	Others
11.	Current to Pneumatic Convertor	Input : 4-20mA Output: 0.2-1.0 Kg/cm ²	2	
12	Test switch & Lamp (16 Point U/C/I Card)	TEST SW 16 point Lamp 16	2	
13	Pneumatic Indicating Controller (Panel)	Control Mode PID Air Supply 1.4-1.6 Kg/cm ² Input signal 0.2-1.0 Kg/cm ² Output signal 0.2-1.0 Kg/cm ² Alarm: Input (Low & High) with side Recorder	1	
14	Pneumatic Recorder	Power : 100-120 VAC (60 Hz) Input signal 0.2-1.0 Kg/cm ² Air supply 1.4-1.6 Kg/cm ² 2 pen	1	
15	EPRON Eraser	10 Pieces of PRON can be erased at the same time	1	

(Handwritten mark)

4. ELECTRONIC INSTRUMENTS LABORATORY

No.	Name	Description	Q' ty	Others
1	Precision Wheatstone Bridge	-Measuring Range : 0.1000Ω- 111.110HΩ (9Range) -Accuracy : 0.01% of setting -Galvanometer (built in) Bridge Power Source (built in)	1set	
2	Logic Analyzer	-Frequency Range : 200MHz -95 Input Channel (Max) -3 Independent Time Axes -3ns glitch Detection -set-up Condition Store/recall -Hard Copy Function -5ns Resolution (200MHz) <u>Optional Accessories</u> -Sync analyzer SL-0220 -GP-IB card SL-0228 -Personality probe adapter SL-0223 -8-bit personality card SL-0227 -Probes : SL-031 or SL-0025 or SL-0024 or SL-0013 or SL-0012 or SL-0011 or SL-0010.	1set	
3	Sampling Scope	-Frequency Range : DC-12.4 GHz-3dB : DC-3.5 GHz-3dB -Sensitivity : 2mv/div-200mv/div -Input Channel : 2 Channels -Sweep time : 20ps/div-50us/div 1-2-5 sequence -Sampling frequency : MAX. 70KHz -Wave form memory : 3.5inch FDD <u>Option</u> -3.5inch FDD SE-3i01 -Dumv case -HF sync probe -Input probe SFP-3A, HZ-501A, 502A	1set	
4	CRT Read Out Oscilloscope	-Frequency Range : DC-100MHz -4 Channel Input and Cursor Measurement -Jitterless Circuit for Stable Triggering -20Kv High Acceleration Voltage -Comment Display : MAX 80 Charactors -Delay Time Range : 0.20-10.20div <u>Option</u> -Current Probe (1) - " Termination (1) - " Amplifier (1) -High Voltage Probe (1) -Viewing Hood B (1) -High Voltage Dividers (2)	1set	

Q

No.	Name	Description	Q' ty	Others
5	Oscilloscope Calibrator	-Output Voltage : 0.12mV to 60V 0.2mV to 100V (18steps) -Output Waveform : square wave -Rise Time : 5us or less -Output Frequency : 0.5Hz - 1KHz (20steps)	1	
6	Electronic Volt Meter	-Frequency : 10KHz to 1000KHz -Voltage Measuring : 300uV to 3V (8 Range) Range <u>Option</u> -Voltage Divider 100:1 and 2pF Probe tip type (100 KHz to 200KHz) -Coaxial T Connector N female (10KHz to 1000KHz) -Termination 50Ω N female (10KHz to 1000KHz) -Termination 50Ω BNC female (10KHz to 1000KHz) -Termination 75Ω BNC female (10KHz to 300KHz)	10set (1) (1) (1) (1) (1)	
7	FH/AH Standard Signal Generator	-Frequency Range : 100KHz-110KHz -Resolution : 100Hz, 1KHz -Modulation : AM,FM,FM stereo -Accuracy : $\pm 5 \times 10^{-4}$ (FM) -Frequency Deviation : 0-99.5KHz carrierfrq.x 10% -Resolution : 0.5KHz -Accuracy : Max value $\pm 10\%$ (STEREO SIGNAL) -Seperation : 55dB (400Hz - 1KHz) -Pilot Signal : 19KHz $\pm 2Hz$ (AM) -Modulation factor : 0-60% -Resolution : 0.5% -Accuracy : $\pm 5\%$	1set	
8	Dual Tracking DC Power Supply	-Output Voltage : 0- +35V, 0- -35V -Ripple : 0.5mVrms -Line, Load Effect : 0.005% +1 -Output Current : +3A, -3A	5	
9	Regulated DC Power Supply	-Output Range : 0-8V, 0-10A 0-16A, 0-5A 0-35V, 0-2.5A 0-30V, 0-1A -Ripple : 300uVrms, (CV) 2mArms (CC)	4	
10	Personal Technical Controller	<u>It Consist of</u> -Controller main unit KC 1202A -Color display monitor KC 3602A -ASCII key/board KC 3302A	1system	

No.	Name	Description	Q'ty	Others
		-Mouse Controller MC0304A -Mouse MC3304A -GP-IB Interface MC0175A -General Purpose I/O Interface MC0170A -A/D Converter MC0131A -D/A converter MC0132A -Hard disk Interface MC0176A -Printer DPR7713A -2K-byte RAM MC0110A -Expansion box Interface MC0101A -Hard disk drive MC2201B -Printer Interface MC0174A -Standard software OS, BASIC, File manage, file converter, hardware diagnostic program -Libraries Statics I (HX5221A), II (HX-5222A) FFT (BASIC) (HX-5223A), Array Function (HX-5225A), Mathematics Function (HX-5220A), Assembler System (HX-5201A), FFT (Assembly Language) (HX-5224A)		
		<u>Option</u> -Expansion Box MC8101A -Expansion Box Interface MC0801A -1KByte RAM OPT03		
11	AC Automatic Voltage Regulator	-Thyristor phase control type -Output voltage : 1 ϕ , 100V \pm 2% 2KVA -Frequency distortion : 60Hz 3% -Response speed : 200ms -Built-in protection circuit -Input voltage : AC100V \pm 15%	1	
12	DC Meter	<u>Portable DC Standard V-Meter</u> -Principle : Moving Coil type (taut band) -Rated Accuracy : \pm 0.5% of full scale -Measuring Range : 0.3/1/3/10V 3/10/30/100V 30/100/300/1000V 3V	7	(2) (3) (1) (1)
		<u>Portable DC Standard A-Meter</u> -Principle : Moving Coil type (taut band) -Rated Accuracy : \pm 0.5% of full scale	17	

No.	Name	Description	Q'ty	Others
13	AC Meter	-Measuring Range :		
		3/10/30/300	uA	(1)
		10/30/100/300	uA	(5)
		0.1/0.3/1/3	mA	(1)
		1/3/10/30	mA	(2)
		10/30/100/300	mA	(4)
		0.1/0.3/1/3	A	(2)
		1/3/10/30	A	(2)
		<u>Portable DC standard V-A Meter</u>		2
		-Principle : Moving coil type (taut band)		
		-Rated Accuracy : $\pm 0.5\%$ of full scale		
		-Voltage Range : 3/10/30/100/300/ 1000V		
		-Current Range : 1/3/10/30A 1/3/10/30/100/300mA		
<u>Portable AC Standard A-Meter</u>		4		
-Principle : Moving Coil type (taut band)				
-Rated Accuracy Range : $\pm 0.5\%$ of full scale				
-Measuring Range : 20/50/100/200mA		(2)		
0.5/1/2/5 A		(1)		
10/20/50/100 A		(1)		
<u>Portable AC Standard V-Meter</u>		4		
-Principle : Moving Coil type (taut band)				
-Rated Accuracy : $\pm 0.5\%$ of full scale				
-Measuring Range : 15/30V		(2)		
75/150V		(1)		
150/300V		(1)		
<u>Portable AC Standard V-A Meter</u>		2		
-Principle : Moving Coil type (taut band)				
-Rated Accuracy : $\pm 0.5\%$ of full scale				
-Voltage Range:30/75/150/300/750V				
-Current Range:0.15/0.3/0.75/1.5 3/7.5/15/30A				
14	Insulation Tester	-Rating : 250V/500 Ω 500V/1000 Ω 2,000V/2,000 Ω		1
		-Accuracy : $\pm 5\%$		
		<u>Option</u>		
		-Hard case		(1)
		-Probe No. 2		(1)
		-Probe case		(1)
		-Probe No. 3		(1)
		-Probe No. 5		(1)
		-Probe No. 4		(1)

No.	Name	Description	Q'ty	Others
15	Audio Amplifier	-Tuner : AM 535-160KHz FM 88-108KHz -Power Output : DC - 200KHz 150W + 150W stereo TMD 0.001% -Receiver type Amp.	1	
16	DC Precision Supply	For Precision DC Potentionmeter 272200 YEW -Output Current : ± 1 to 105mA DC (max. output 10V DC) -Stability : ± 5 ppm/10 minutes ± 20 ppm/hour ± 20 ppm/ $^{\circ}$ C	1	
17	Voltage Ratio Box	For Precision DC Detentionmeter 272200 YEW -3/7.5/15/30/75/150/300/750/1500V -Accuracy : ± 0.01 or $\pm 0.02\%$	1	
18	Standard shunt	-For Precision DC Potentionmeter 272200 YEW -Shunt 2A -Shunt 5A -Shunt 10A -Shunt 20A -Shunt 50A -Shunt 100A -Accuracy : $\pm 0.05\%$	6 (1) (1) (1) (1) (1) (1)	
19	Standard Resistor	For Precision DC Potentionmeter 272200 YEW -0.001 Ω , 0.01 Ω , 0.1 Ω , 1 Ω , 10 Ω , 100 Ω , 1K Ω , 10K Ω , 100K Ω 1M Ω ,	10 (each)	
20	DC Power Supply	For Measuring Receiver HL521B Anritsu -Contains 12V, 7.5AH Charger	1	
21	Attenuator	-Frequency Range : DC-150KHz -Variable Range : 0-121dB 0.1dB step -Type : Balanced Unbalanced	10 (5) (5)	
22	Portable Audio Frequency Voltmeter	-Principle : Moving coil type with rectifier -Rated Accuracy : $\pm 0.5\%$ of full Value at 45Hz to 10KHz -Range : 30/75/150/300V -Scale length : Approx 135mm -Scale Division : 150 -Deflection Angle : 85°	1	

No.	Name	Description	Q' ty	Other
23	Portable High-frequency Ammeter	-Principle : Moving coil type taut band suspension system with self-contained vacuum couple -Frequency coverage : DC, 10Hz-50Hz -Rated accuracy : $\pm 1.0\%$ of full scale value at 50Hz -Frequency Influence : Max 1.0% -Range : 5/10/20/50mA	1	
24	Portable High Frequency Voltmeter	-Principle : Moving Coil type taut band suspension system with self-contained vacuum couple -Rated Accuracy : $\pm 0.5\%$ of full scale value at 50Hz -Frequency Influence : MAX 1.0% -Range : 15/30/75/150V -Frequency coverage : DC, 10Hz-100Hz	1	
25	Portable wattmeter	-Principle : Electrodynamometer type -Rated Accuracy: $\pm 0.5\%$ of fullscale value -Frequency Range : DC, 25 to 1000Hz -Voltage Range : 120/240V -Current Range : 5/25A	1	
26	Reference Oscillator	For synthesized signal generator MG65A Anritsu -Aging rate : $5 \times 10^{-3} \%$ /day	1	
27	Hard Copy	For Logic Analyzer -SL-4601 Ivatsu	1	
28	DC Power Supply & DC cable	For FH Transceiver TH2550A KENWOOD -DC13.8 VDC at 10A	1	
29	DC Power supply	For communication Receiver R-5000 KENWOOD	1	
30	LoopANT with Tripod	For measuring Receiver ML521B Anritsu Measuring Range : 25 to 230MHz -Type : LoopANT -Tripod	2 (1) (1)	1

5. MACHINERY DESIGN ROOM

No.	Name	Description	Q' ty	Others
1	CAD/CAM System	<p>o HARDWARE</p> <p>1. CPU : 32bit, 0.9MIPS, FPU 2. MEMORY : 8MB 3. KEYBOARD: ASCII KEYBOARD 4. CRT : 19" COLOR 5. HARD DISK : 160MB 6. TABLET 7. PRINTER : 24X24 OR MORE THAN 8. COMPUTER FOR D.N.C. - CPU : 16 bit - MEMORY : 1MB - DATA COMMUNICATION SYSTEM 9. N.C MACHINE FOR EDUCATION</p> <p>o SOFTWARE</p> <p>1. GENERAL SOFTWARE FOR E.V.S - 3-D CAD/CAM GENERAL SOFTWARE - OS SYSTEM (UNIX) - FORTAN 77 - DNC SOFTWARE - DATA BASE - C-COMPIER 2. BASIC COMPILER 3. MECHANISM MOTION ANALYSIS 4. MOLD DIE DESIGN SOFTWARE 5. SOFTWARE FOR TRANSITION FROM 3-D MEASURING M/C CODE TO N.C</p>	<p>3</p> <p>1</p> <p>1</p> <p>each 1</p>	<p>SOFTWARE IN- CLUDE</p>

6. DIE AND MOLD MACHINING SHOP

No.	Name	Description	Q'ty	Others
1	FANUC PROGRESSIVE DIE CAD / CAM SYSTEM	System	1	
		. 20" CRT and Tablet	(1)	
		. FANUC PROGRAM FILE	(1)	
		. XY Plotter	(1)	
2	Machining Center	. Software for Progressive Die		
		. Table working surface	1	
		1,100 x 420 mm		
		. Table max. travel(x,y,z)		
		760 x 430 x 510 mm		
		. Spindle taper JIS No. 40		
		. Spindle speed 10 - 4,000rpm		
		. Spindle motor AC 5.5kw(cont.)		
		7.5 kw (30min.rate)		
		. Hydraulic motor 1.5kw - 4P		
		. Tool Storage Capacity 20tools		
		. Standard Accessories		
		Operation tools	(1)	
		Levelling bolts and plate	(1)	
		Work light	(1)	
		Chip pail	(1)	
		Chip guard	(1)	
		Spindle load meter	(1)	
		& speed meter		
		Spindle oil cooler	(1)	
		(air cooling type)		
		. AC Unit FANUC 11H-A		
		<u>Optional Accessories</u>		
		Cutting oil device	(1)	
		chip air blow device	(1)	
		Splash guard "A"	(1)	
		Automatic power breaker	(1)	
		Work-off light	(1)	
		Alarm lamp	(1)	
		Circuit breaker for	(1)	
		electrical leakage		
		3-axes manual handwheel	(1)	
		Tool length measurement		
		Input output terminal		
		Automatic programming		
		device (ESCON-II)		
		Automatic origin return		
		function		
		Tooling set	(1)	
		Tape reader with reel		
		Machine vise 170mm	(1)	
		Custom MACRO		
Inch / Metric conversion				
Optional angle corner R				
Helical interpolation				
Tool lock fixture	(1)			
Centering microscope	(1)			

7. AIR CONDITIONING LABORATORY

No.	Name	Description	Q'ty	others
1	Boiler	Type:once-through Capacity : 100kg/h steam 54,000Kcal/h fuel consumption : 6Kg/h	1	
2	Refrigerating M/C	Type:Water cooled packaged water chiller Capacity : 58,000Kcal/h Capacity step : 100-50-0 %	1	
3	Cooling Tower	Type:Counter flow, standard Capacity : 67,000Kcal/h Water flow rate : 220 l/min	1	
4	Heat Exchanger	Capacity : 50,000kcal/h Heating source : steam Max. working pressure:5kg/cm ²	1	
5	Steam header	Dimension : 100Ax1000L Max. working pressure : 3kg/cm ²	1	
6	Hot Water Header	Dimension : 100Ax1500L Max working pressure : 5kg/cm ²	2	
7	Hot Water Header	Dimension : 50Ax700L Max. Working Press : 5kg/cm ²	2	
8	Chilled Water Header	Max working press : 5Kg/cm ²	2	
9	Cooling Water Pump	220 l/min x 15H Type : Volute	2	
10	Oil pump	Capacity : 8 l/min x 0.2kw, 3 φ, 220V	1	
11	Hot Water Pump	220 l/min x 15H	1	
12	Circulation pump (chilled water pump)	250 l/min x 15H Type : Line	2	
13	Air Conditioning Unit	Type : Horizontal Air flow rate : 174CMH Cooling capacity : 72,700Kcal/h Heating capacity : 63,900Kcal/h Steam spray	1	
14	Booster Coil Unit	Blower : 1000m ³ /h Capacity : 1000 m ³ /h	1	
15	Fan Coil Unit	Type : Floor open Cooling capacity : 1,800Kcal/h	1	
16	Fan Coil Unit	Type : Floor concealed Cooling capacity : 1,800Kcal/h	1	
17	Fan Coil Unit	Type : Ceiling Cooling capacity : 1,800Kcal/h	1	
18	Fan Coil Unit	Type : Ceiling concealed Cooling capacity : 1,800Kcal	1	
19	Packaged Type Air Conditioner	Type:Wall mount, Heat Pump Capacity : 2RT	1	
20	Circulation Blower	174 m ³ /min x 45mm ² φ	1	

No.	Name	Description	Q' ty	others
21	Blower	180 m ³ /min x 32mmHg	2	
22	Supply Blower	Ventilation Dia : φ 250	2	
23	Air Conditioning Control Panel	For above the system	1	
24	Electric Power Source	For above the system	1	
25	Central Control Panel System	For above the system	1	
26	Process Feedback Control Study Unit	1. Desired value set station -Scale length : 100mm -Program cycle : 24hr type 2. Recorder & controller 1) Electronic recorder -Mounting : Panel mounting -Input signal : 1 to 5V D.C 2) Electronic controller -Cascade setting signal : 1 to 5V D.C 3. Manipulator 1) 2-way selector -Selecting system : Manual -Input signal : 4 to 20mA D.C -Output signal : Ditto 2) Control for temperature -Electric heater (3KW) 4. Controlled system -Metering water tank : φ 105 x 1150L 5. Primary means (Detector) -Temp. detector : Thermal resistor 100 Ω x 3wires -Flow rate detector : Range 500l/hr -Level detector : Level selector 6. Transmitter & convertor -Flow rate, level transmitter -Pressure transmitter -Temperature transmitter 7. Water feed device 8. Measuring pick up 9. Compressor	1	
27	Air flow Demonstration Apparatus	1. Fan : centrifugal turbo flow rate(max) 30 m ³ /min Delivery pressure(max) 130mmHg Rotational speed 2200-1230-rpm 2. Drive motor & variable speed device 2.2Kw 3. Air duct 240mm 4. Air Flow rate control device throttle-value-setting 5. Air Flow rate measuring detectors 6. Air velocity 7. Friction loss measuring tape in air duct 8. Instrument etc.	1	

8. MECHATRONICS APPLICATION LABORATORY

No.	Name	Description	Q'ty	Others
1	Mechatronics Training Kit	1) I/O Interface 2) Position Sensor by ball-screw 3) Position Sensor by wire 4) Stepping Motor Kit 5) DC Servo-motor Kit 6) Servo Feedback Kit 7) Actuator (Pneumatic), Chip handler 8) Actuator (Pneumatic), Melody finger 9) Air source for Pneumatic Machine 10) Mechanical control, Robot arm 11) 3-axis Robot Kit 12) Automatic transmission model 13) Sequencer 14) ATM Logic model 15) Hardware manuals, Cables, Training Books of each kit	2 (10) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2)	
2	Magnetic Circuit training Apparatus	. Magnetic coil : 250, 500, 750, 1000 turns with terminal each . Power house for magnetizing Manual : DC 0 - ± 4 A Auto : AC 0 - ± 4 A 5 Hz . Probe : Hall element type, Vertical and Horizontal type each 1 pce. . Gauss Meter , Measuring range: $\pm 0.02, \pm 0.1, \pm 0.5$ Wb/m ² . Iron core : iron, ferrite and alnico each 1 pce.	1	
3	Electromagnetics Induction Experiment Apparatus	. Suction power measurement of electromagnetics . Electromagnetics : 0.8 ϕ 180 turns solenoid with iron core . Balance : capacity 0 - 500 g . Stand : 0 - 4 N with graduated in newton . Power source : stabilizer output 0 - 4 A . Electromagnetics measurement : solenoid 1.2 ϕ 500 turns with balance plate	1	
4	Digital Dynamometer	Digital electronic measuring type . Eddy current brake dynamometer -Capacity : 2kg -Exciting current : about 3.2A -Sensor : Load cell & Rotary encoder -Field regulator . Digital indicator -Measuring item : Torque , Revolution	1	

No.	Name	Description	Q' ty	Others
5	Computer Control Experiment Apparatuses	<ul style="list-style-type: none"> . 8bit parallel I/O . Contact Input . A/D converting Amplifier . D/A " " " . Inverter Controller . Inverter . I/O signal Display . Counter (Serial Parallel Conversion) 	1	
6	Transistor Circuit Experimental Equipment	<p style="text-align: center;">TRAINING CONTENTS</p> <ul style="list-style-type: none"> . Measuring of Static Characteristics of Semiconductor . Calculation of fixed values on transistor equivalency circuit (h - parameter) . Characteristics of RF Amp. . IF Amplifier Circuit . Performance of Detector Circuit . AF Amplifier Circuit . Frequency Converter . AF power Amplification Circuit . Pulse-Generator Circuit . Circuit-off & saturation characteristics of transistor . Multi-vibration Circuit . Stabilized Circuit of power supply 	1	
7	CNC Training Lathe	<ul style="list-style-type: none"> . Swing over bed : 200mm . Distance between center: 400mm . Spindle bore : ϕ 20mm . Spindle taper : MT 3 . Spindle speed : 25-2000rpm . Motor : DC servo 450W . Power : 1 ϕ , 200V 2.2 KVA . CNC Control system . Control system : open loop . Simultaneously controllable axes : two axes . Programming : Absolute, incremental . Incremental system: X axis 0.01mm . " " : Z axis 0.005mm . Input of part program: Input by MDI Keyboard . Memory capacity: 12,000 characters Special acc. 1) Automatic turret tool post 2) Simulation plotter 3) Optical tool setting gauge 4) Work stopper 5) Collect chuck 6) Rolling center 7) Spindle center 8) Tool holder (ϕ 4, ϕ 6, ϕ 8, ϕ 10, ϕ 12) (ϕ 14, ϕ 16) 9) Trainer 10) Tool bit set 	1	

No.	Name	Description	Q'ty	Others
8	CNC Training Milling Machine	<ul style="list-style-type: none"> . Table dimension : 600x200mm . Axis travel : X axis 300mm Y axis 200mm Z axis 350mm . Spindle nose : JIS NT No. 40 . Spindle speed : 30-3500rpm . Spindle motor : DC servo 1.1Kw . Power : 3 ϕ, 220V, 3.5 KVA <u>CNC Control system</u> . Control system : Open loop . Simultaneously controllable axis : 3 axis . Increment system : X, Y, Z 0.001mm . Memory capacity for part Program : 24,575 character <u>special acc.</u> 1) Machine vice (manual) 2) Automatic index table 3) " tool changer (8 pieces) 4) 4" chuck (manual) 5) Tail stock (manual) 6) Tool set 	1	
9	FFT signal Analyzer	<ul style="list-style-type: none"> . Processing Mode - Auto mode, Manual Mode, Program mode, Basic Mode . Analytic Function - cross power spectrum, Auto power spectrum, Transfer function, Linear spectrum (FFT), Coherence function, 1/3 Octave Analysis, etc. . 0.2Hz-100KHz, 72dB/oct dynamic range . A/D Converter resolution: 12bit . input : 2 channel ± 0.1 V to ± 200V/Full scale . Memory capacity : 16bit x 64K word . mini-floppy (256K byte double side, double density) . GP-IB Standard . Basic program with Key board . Option scope wagon 	1	

No.	Name	Description	Q'ty	Others
10	Microcomputer Training Kit	<ul style="list-style-type: none"> . CPU = 8085A . Clock = 2.45MHz . ROM = 2Kbyte <li style="padding-left: 20px;">= Max 8K byte . RAM = 1K byte <li style="padding-left: 20px;">Max 3K byte . Display = 8 Column <li style="padding-left: 20px;">7 Segment LED . Parallel I/o Port 	15	
		<p style="text-align: center;"><u>Accessory</u></p> 100 pin connector	15	
11*	Digitizer	<ul style="list-style-type: none"> . Reslution = 0.001" . Accuracy = 0.02" . Rate = 150 Pairs/sec . Active surface area <li style="padding-left: 20px;">= 11" x 11" or 11.7" x 11.7" . Electronics and Universal <li style="padding-left: 20px;">Power supply housed inside <li style="padding-left: 20px;">the tablet . 4 - Botton Cursors . Connection Cable 	3	
12	Paper tape puncher/ Reader , Printer	<ul style="list-style-type: none"> . Tape Reader <li style="padding-left: 20px;">8 channel paper tape <li style="padding-left: 20px;">reading speed : 250 char./sec . Tape puncher <li style="padding-left: 20px;">8 channel paper tape <li style="padding-left: 20px;">Punching speed : 50 char./sec . Printer <li style="padding-left: 20px;">char./line : 40 <li style="padding-left: 20px;">printing speed : 1/2 lines/sec . RS - 232 C Interface <p style="text-align: center;"><u>Accessory</u></p> RS - 232 C Connection Cable Manual	1	

* Without getting a digitizer in Japan, the item may be cancelled.

9. HEAT TREATMENT LABORATORY

No.	Name	Descriptions	Q' ty	Others
1	High Frequency Induction Furnace	1) Model : Vacuum tube type 10Kw, 20/100KHz 2) Current transformer : 10Kw, 20/100KHz 3) Vertical quenching M/C : Stroke 300 mm 4) Operating panel 5) Heating coil (For ϕ 25) 3type(3pcs) 6) Adaptor for heating coil, 2pcs 7) High frequency output lead & duct 1m 8) Frequency change: 20/100KHz 9) Sprinkler 10) Quenching liquid unit 1set : tank, pump, cooler, etc. 11) Spare parts for one year 12) Square Cu pipe (in mm) 6 x 6 x 1.0(t) x 1000 x 4EA 8 x 8 x 1.0(t) x 1000 x 4EA 13) Others	1	
2	Electric Salt Bath Furnace	1) Temperature : 150-350 C 2) Effective size : 200(w) x 280(l) x 230(h) 3) Power : 3 ϕ 220V, 9Kw 4) Operating panel : Automatic temp. controll & recording 5) Transformer, Salt, Electrode, etc.	1	
3	Quenchiometer	1) Power : 100V, 50/60Hz, 1.2Kw 2) Temperature : 25- 900° C 3) Heater : Silver shaft heating 4) Others Silver shaft (JIS 2526), 3EA Others <u>Optional accessories</u> 1. X-Y type Automatic Temp. Control & Recorder	1	
4	Fluidized Heat - treatment Furnace	1) Dimension : inner Dia. :200 ϕ Height : 300 mm 2) Max. temp : 1050 °C 3) temp. accuracy : 5.0 4) Power : 8Kw 5) Others	1	

10. SURFACE TREATMENT LABORATORY

No.	Name	Description	Q' ty	Others
1	Analytical Balance	1) Maximum Capacity : 200g 2) Minimum Reading : 0.1mg 3) Standard Deviation : 0.1mg 4) Linearity : $\pm 0.2\text{mg}$	1	
2	Metallurgical Microscope	1) Total Magnification : 35x-2,000x 2) Focusing Mechanism: 1. coarse adjustment 2. fine adjustment 3) Electric power source: single phase 110V 50/60Hz <u>Optional accessories</u> 1. polaroid camera - 1	1	
3	Micro-vickers Hardness Tester	1) Test Load : 10, 25, 50, 100, 200, 300, 500, 1000 2) Accuracy : Better than $\pm 1\%$ <u>Accessories</u> 1. standard vice - 1 2. setting table (slender) - 1 3. slope table - 1 4. setting table (thin) - 1 5. microscope for measuring - 1 6. hardness tester piece - 1 7. power cord - 1 8. pilot lamp - 1 9. hardness calculator table - 1 10. diamond penetrator - 1 11. knoop penetrator - 1	1	

9. ま と め

長期調査チームとして、最大の問題点としたのは、第3次供与機材分の空調関係設備工事等の関係からも、ITTIの動力資源研究所への移転時期であり、金院長と協議に入ったところ1989年4月にはまず確実であるという返答があり、訓練実施上問題はあるにせよ、特に空調関係システムは1989年4月以降に機材搬入、その他機材はできるだけ早くというスタンスで各科別協議に入った。

まず第1次供与機材がすでに搬入され、据付工事も終り訓練に使用されており、その状況視察と機材に関する問題点(前述)を協議した。効果的に訓練を実施して行くため、特に1クラス訓練生数が多いこと、また在職者訓練実施上オプション関係の要望がなされたが、これは第2次、第3次供与機材にもいえることであり、特にその点に留意し第3次供与機材の選定を行ったが、訓練を実施して行く過程で今後も必ず要望が出されると思われ、ITTI金院長からも強く要望がなされており、日側の対応が必要となってくるものと思料される。

なお第3次供与機材協議においては、特に以下の点に留意しITTI関係者と協議を行った。

- ① 予定予算内(各科別及び全体)に修まること。
- ② 第1次、第2次供与機材との関連性を重要視すること。
- ③ 訓練目標の達成はできるか。
- ④ 付属品は適性であるか。

協議過程において、特に留意事項とされるのは下記のとおりである。

① 機電応用

デジタイザーは、仕様及び既存のIBM-AT(パソコン)

ソフトウェアのAUtoCAD上で動作する必要がある、もし適用しないデジタイザーは使用できないため、日側にて購入不可能な時はキャンセルとする。

② 電子機器

ロジックアナライザのオプションは、予算の関係もあり次の順位とする。

- A. SL-031 (80286用パーソナリティプローブ)×1
- B. SL-0025 (68000用パーソナリティプローブ)×1
- C. SL-0012 (8085A パーソナリティプローブ)×1
- D. SL-0011 (6809用パーソナリティプローブ)×1
- E. SL-0010 (6802用パーソナリティプローブ)×1

③ 熱処理

高周波炉の設置にあたり電波障害、変電室等はすべて韓国側で実施する。

④ 表面処理

各タンクに付くヒュームフード (22個) が日側図面に記載がなく追加することとする。
なお廃液処理は韓国側にて実施する。

⑤ 空気調和

システムの施工は韓国側で実施する。但しレイアウト図及びシステム系統図は韓国案を参考とし、教育用であることを充分配慮し、設計は日側にて実施する。

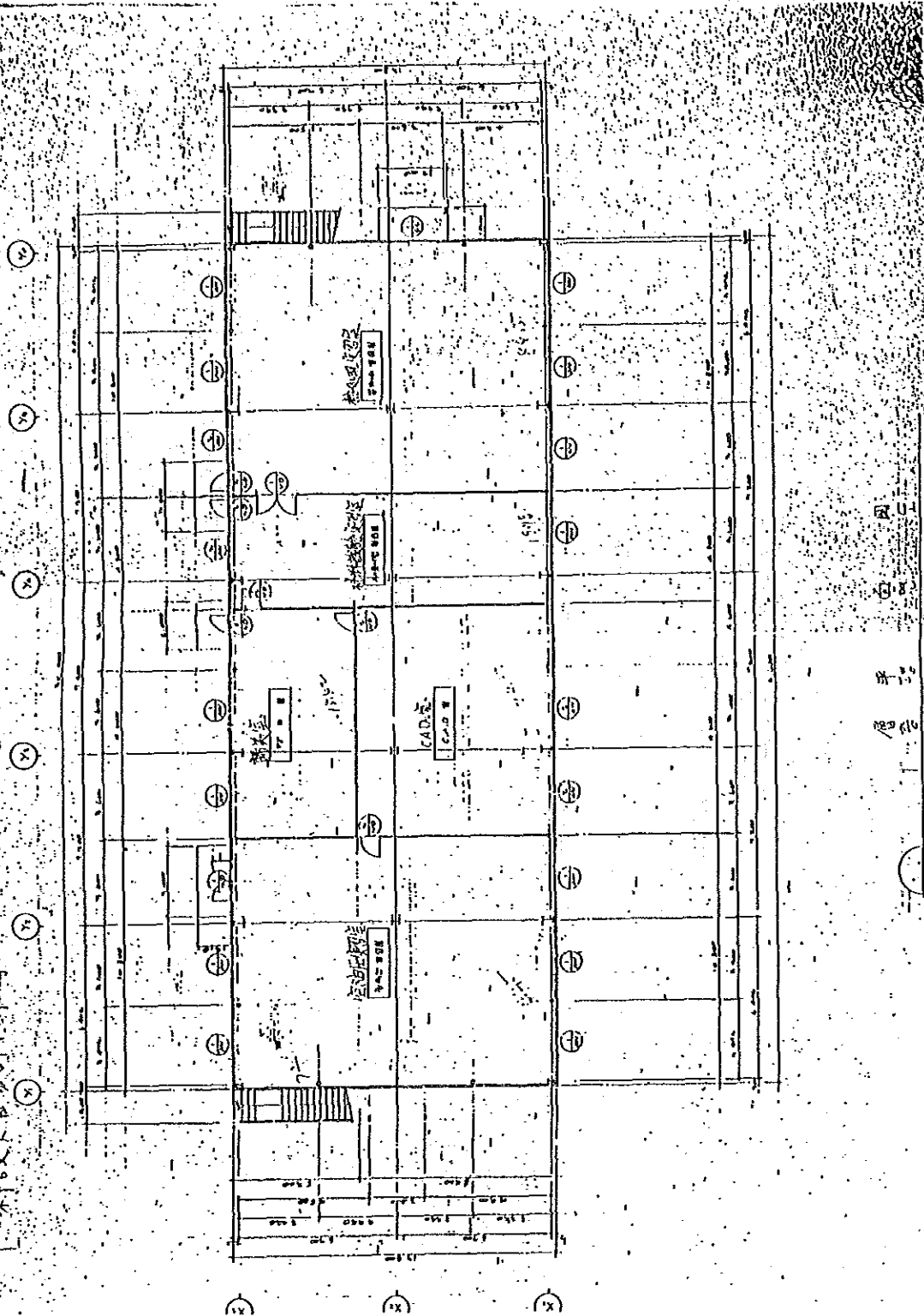
前回の長期調査チーム訪韓時点 (昭和61年12月) においては、新サイト (動力資源研究所跡) への移転時期がずれたため、仁川市にある KIMM の鋳物研究部の建物に機材を仮設置するという話し合いが行われたが、その後 KIMM の組織変更があり、訓練院が ITC の附施設から ITTI として独立した経緯もあり、現実習棟がある ITC 実習室 (九老区) の中庭に、13.8m×36m で2階建の計1,000m²を建設設計は終わっている。2 F は教室にし、1 F に空油圧、CAD/CAM、材料試験、熱処理実習室とすることを予定しており仁川市に比べ訓練生、職員にとり通学、出退勤すべて良く適切と思われる。

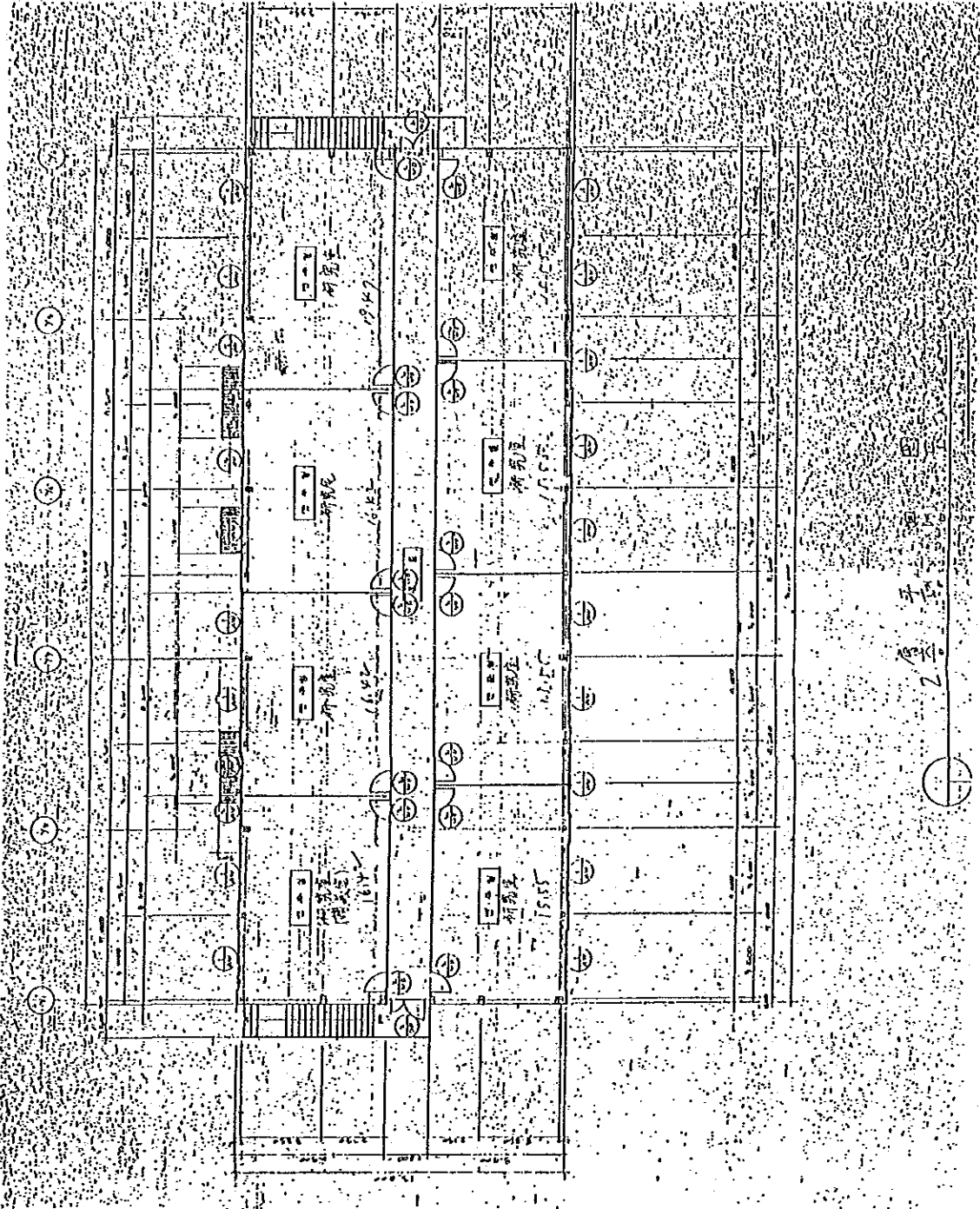
付 属 資 料

1. 新設実習場及びレイアウト図	115
2. 年次別機材供与状況	129
3. 2次年度機材据付，試運転及び教育指導要請（案）	189
4. 第3次機材要請（案）	193

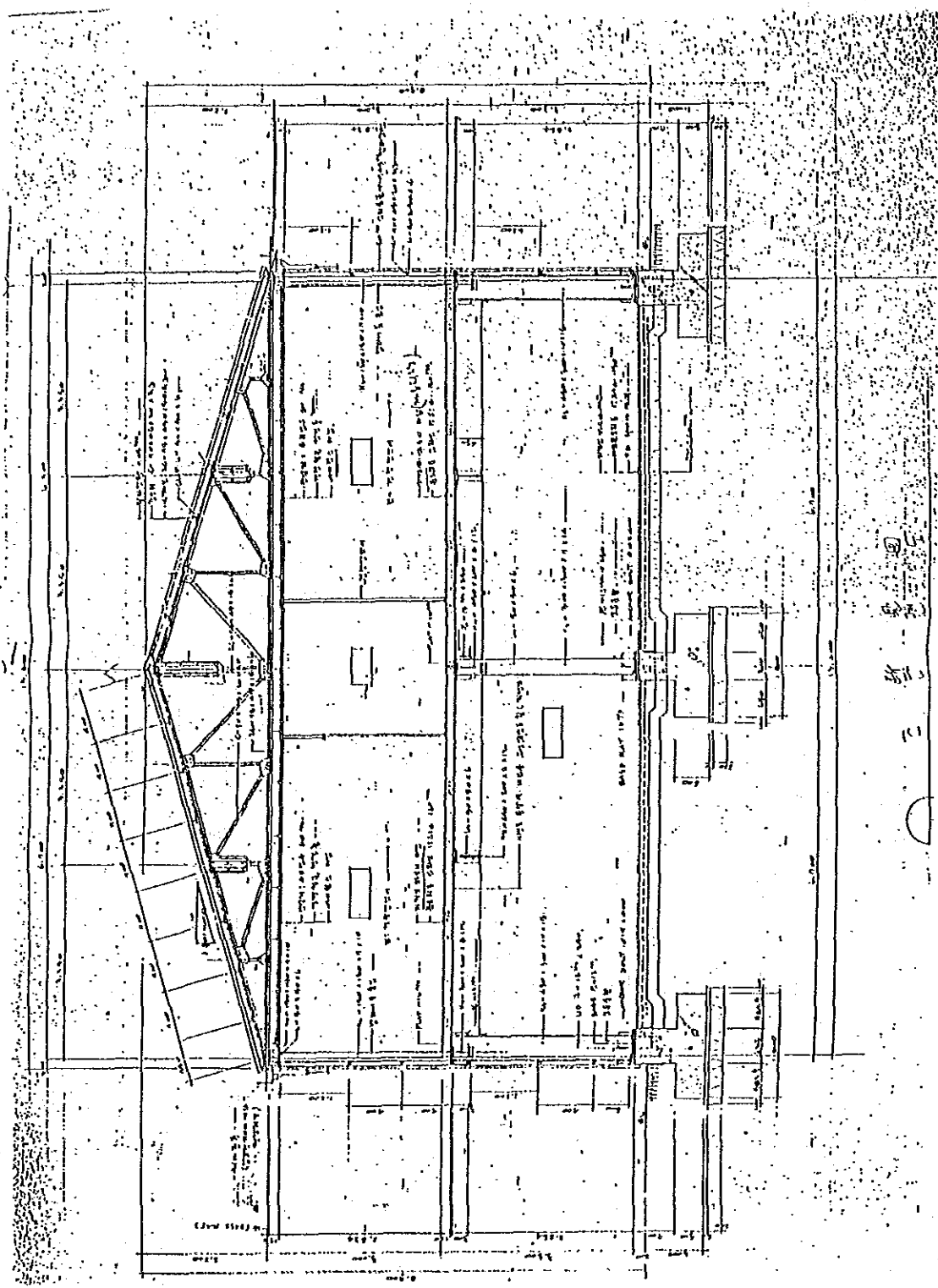
1. 新設実習場及びレイアウト図

新設東路場設計圖





2 层

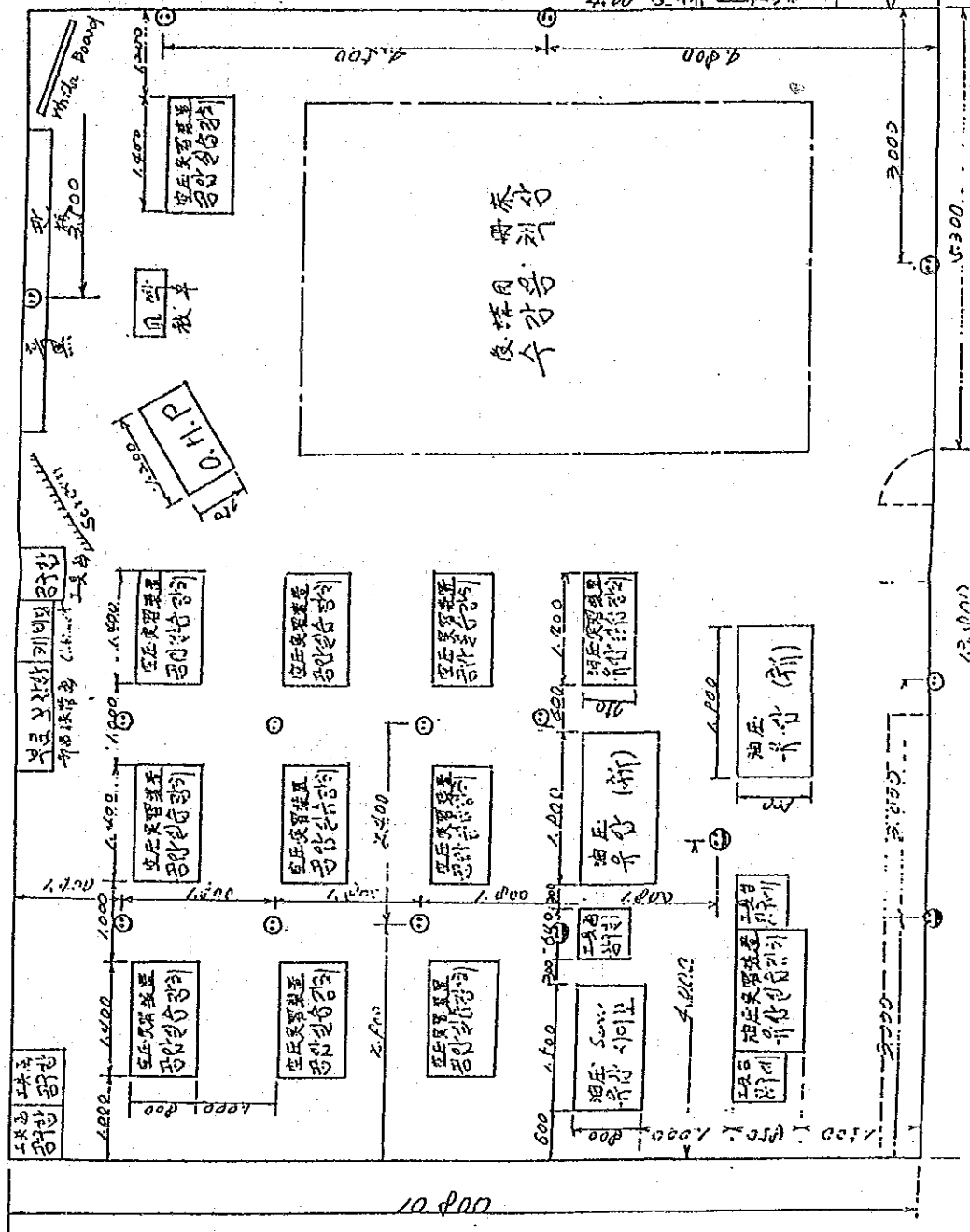


Scale $\frac{1}{50}$

油圧昇降機 LAY-OUT 図 配置圖

110V=6KW
220V=10KW
MK01=NOT

此機はエレベーターから
直接に本階に
降りて来る

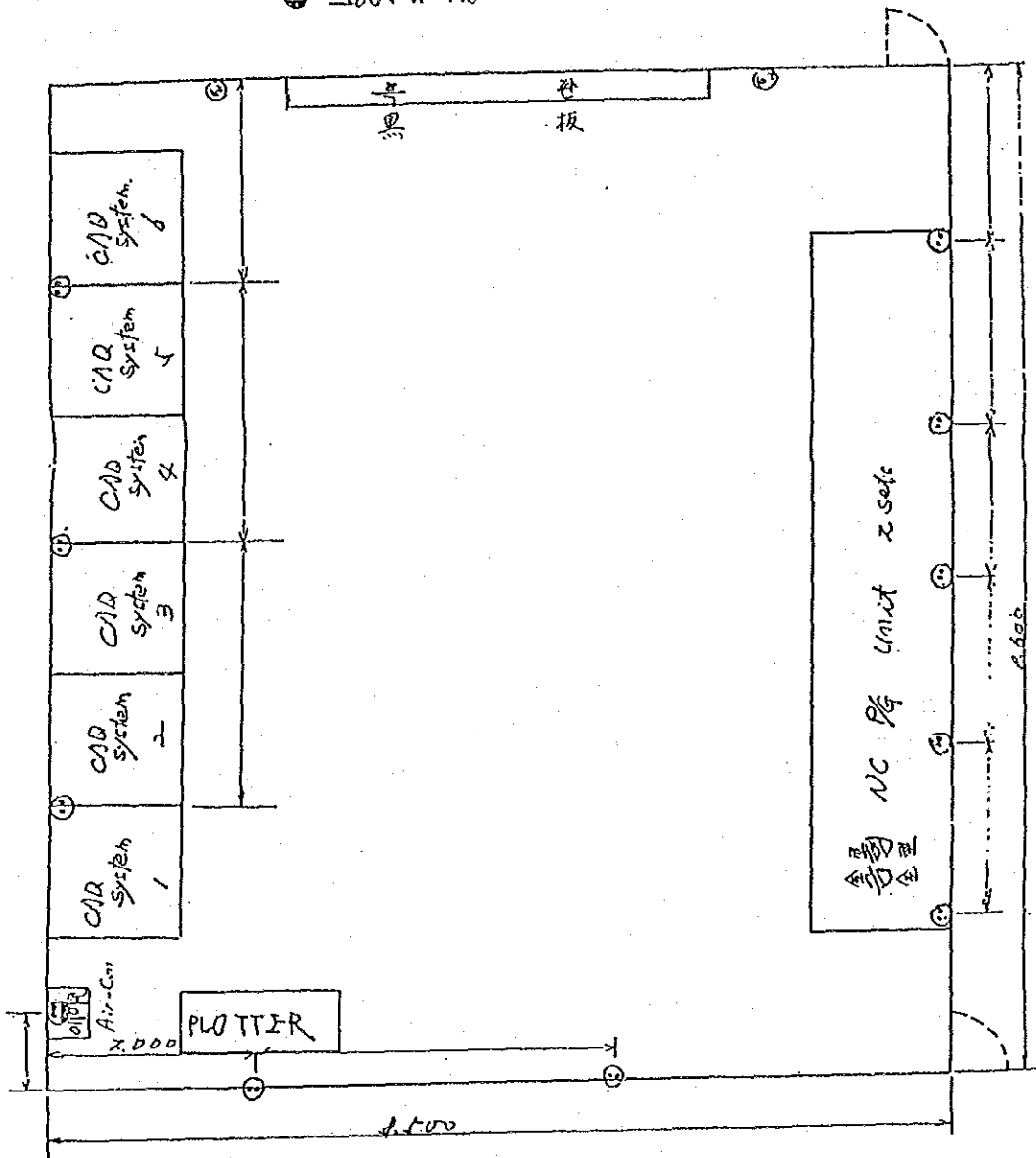


(47坪)

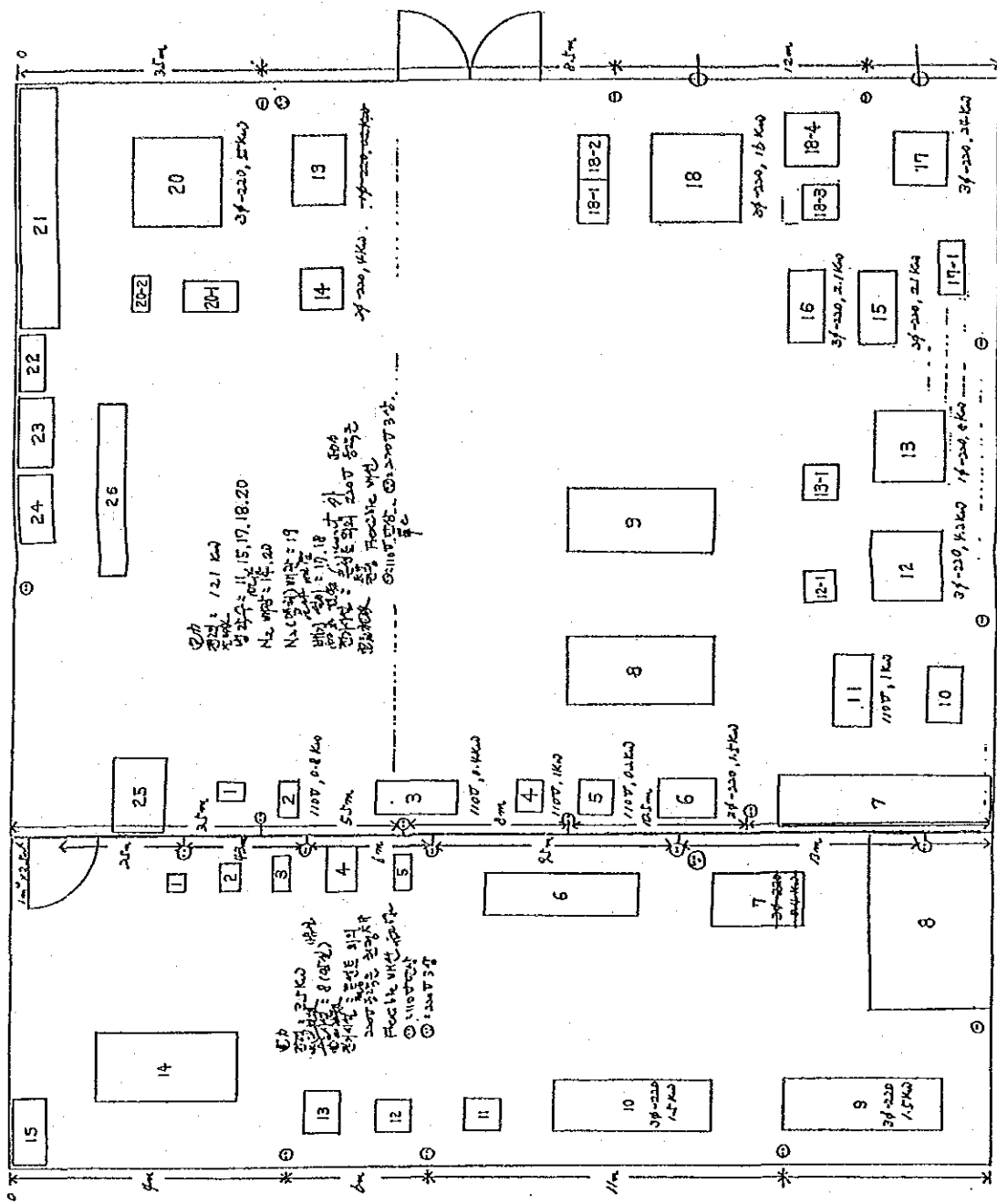
CAD/CAM 配線 LAY-OUT 図 11/15
配線図

Scale $\frac{1}{50}$

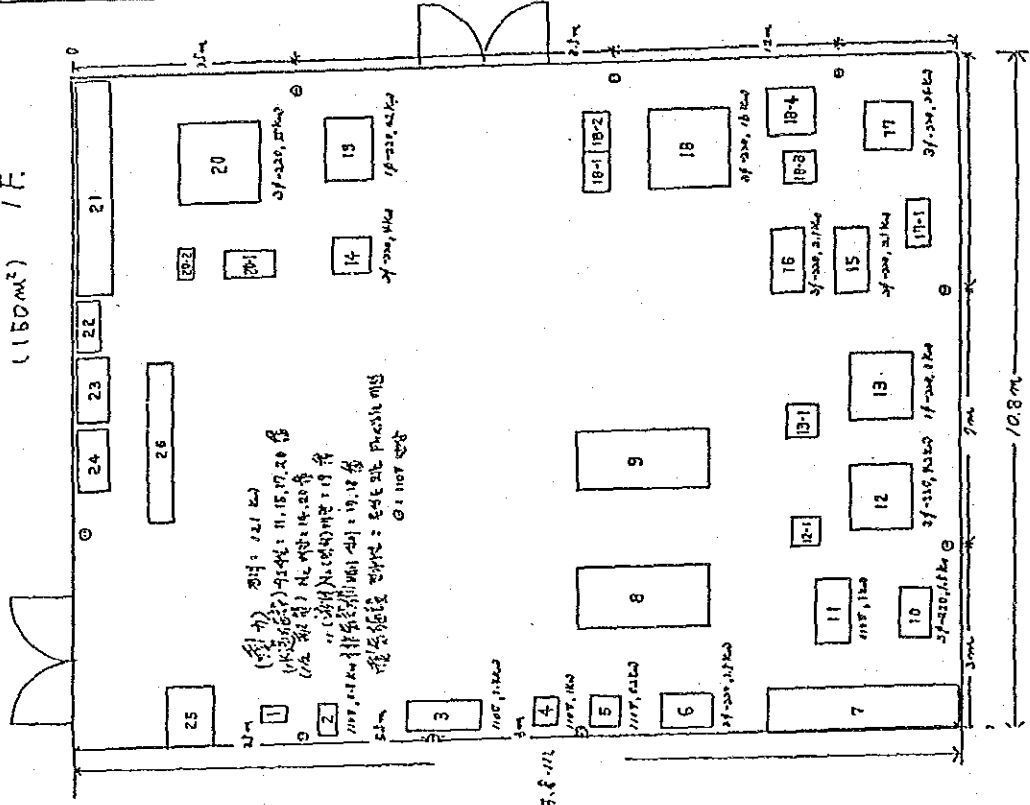
- ⊙ 110V : 1.2 KW
- ⊕ 200V : 1.2 KW



(25坪)



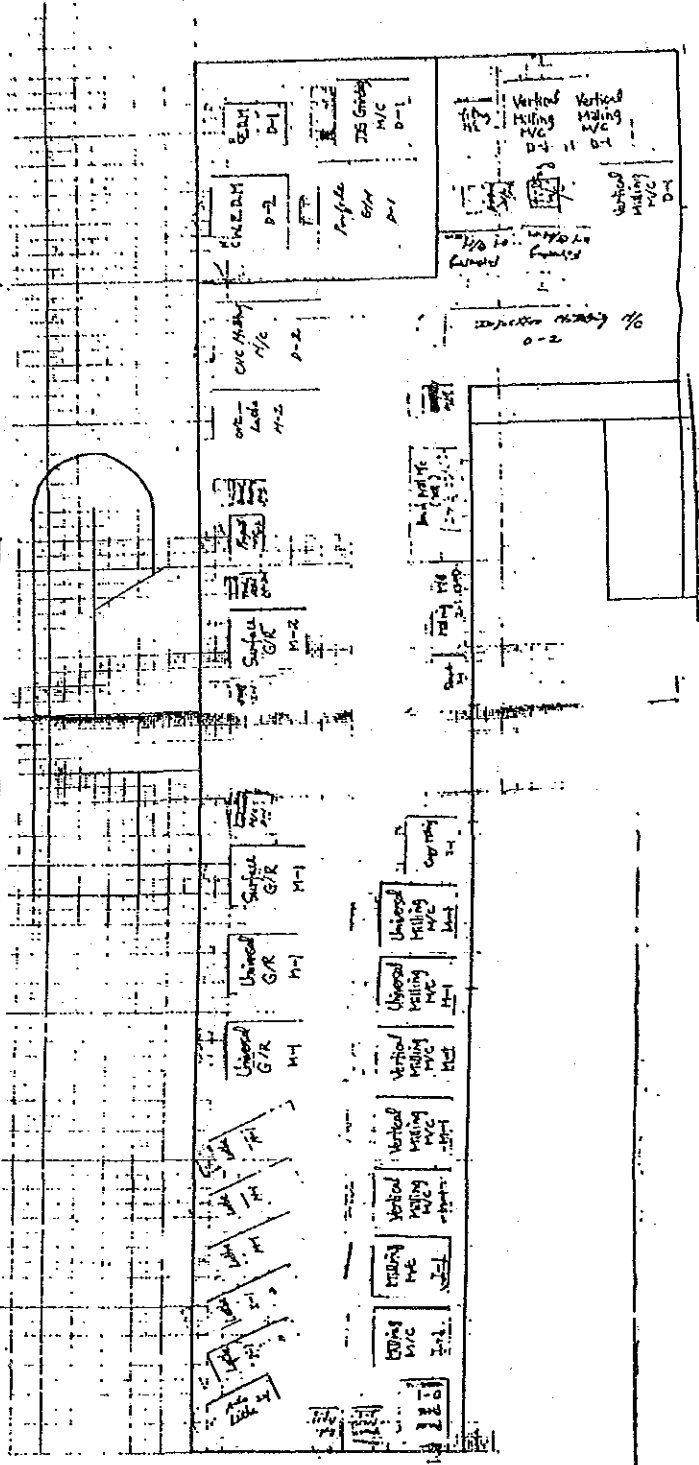
(150m²) / F



- 열처리 실험실 (열처리 실험실)
1. 금속 현미경 (Metallogical microscope)
 2. 건조 건조기 (Hot air-dryer)
 3. 시편 연마기 (Polishing machine)
 4. 시편 장착기 (Mounting press)
 5. 불꽃 시험기 (Spark test specimen)
 6. 고속 회전기 (Wheel cutter)
 7. 실험기 보관함 (Metal shelf)
 8. 작업대 1 (Working table 1)
 9. " 2 (" 2)
 10. 자분 탐상 시험기 (Magnetic particle tester)
 11. 조미나 시험기 (Grinding tester)
 12. 전기 미끄럼틀 (Sluffing furnace)
 13. 12-1 판넬 (Panel)
 13. 13-1 판넬 (Tempering furnace)
 14. 14-1 판넬 (Panel)
 15. 열처리 용기 (Spot furnace)
 16. 소금 수조 (Salt pouring tank)
 17. 소금 수조 (Water)
 18. 온도 비스킷 (Salt bath furnace)
 19. 17-1 판넬 (Panel)
 18. 원반 (Carburizing furnace)
 - 18-1 CO₂ 분석기 (CO₂ analyzer)
 - 18-2 CO₂ 분석기 (CO₂ analyzer)
 - 18-3 판넬 (Panel)
 - 18-4 조미나 (Grinding)
 19. 산화 시험기 (Substrates treatment)
 20. 진공 (Vacuum furnace)
 - 20-1 판넬 (Panel)
 - 20-2 진공 펌프 (Vacuum pump)
 21. 서랍장 (Private cabinet)
 22. 캐비닛 (Cabinet)
 23. 전기 보온함 1 (Instrument storage)
 24. " 2 (" 2)
 25. 초음파 탐상기 (Ultrasonic tester)
 26. 이동식 진판 (Movable blackboard)

DIE & MOLD, MACHINING SHOP

302 → 400

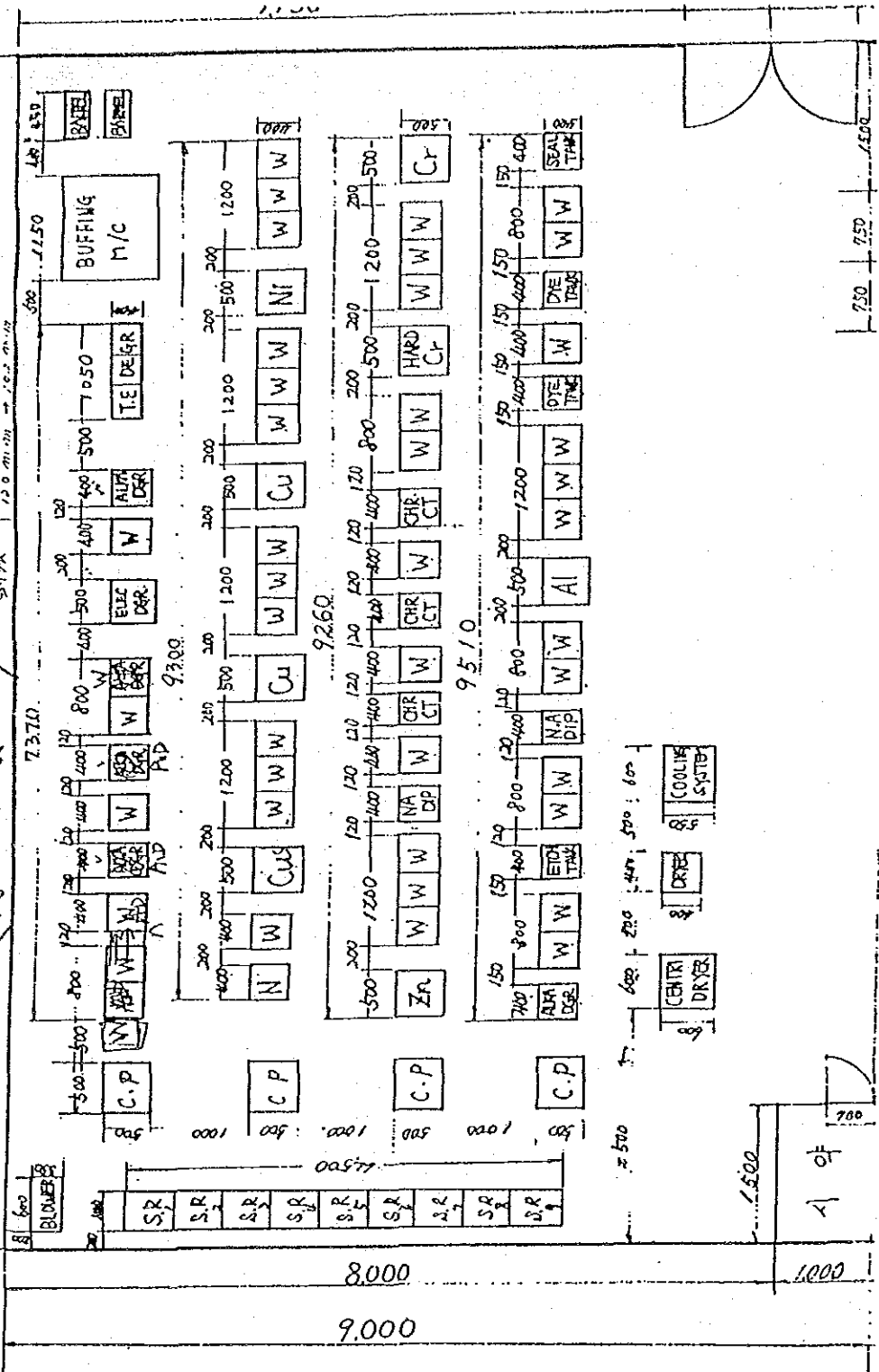


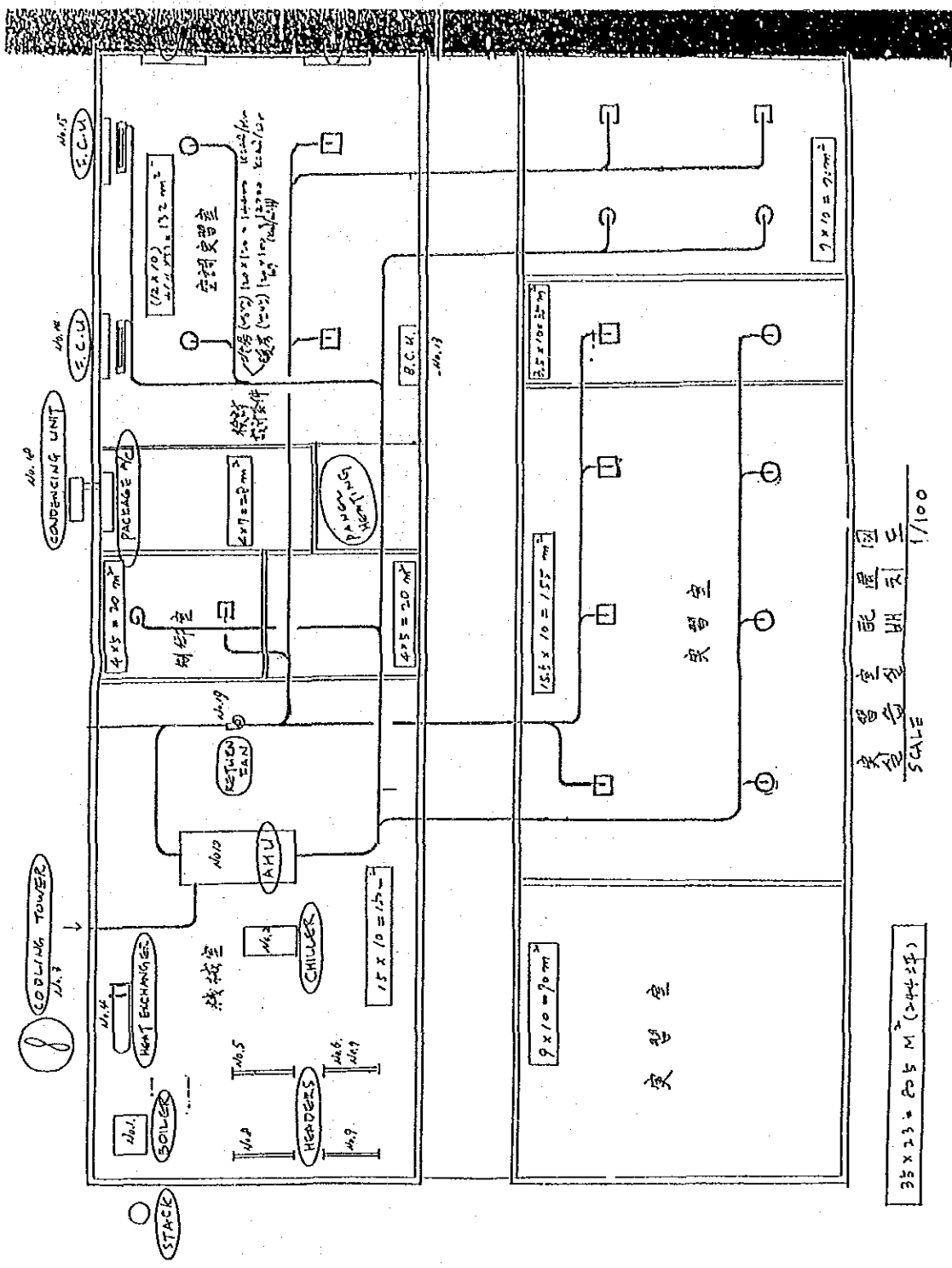
(KORSA(空)) 17.8m

花面处理室

9.1m
9.5m

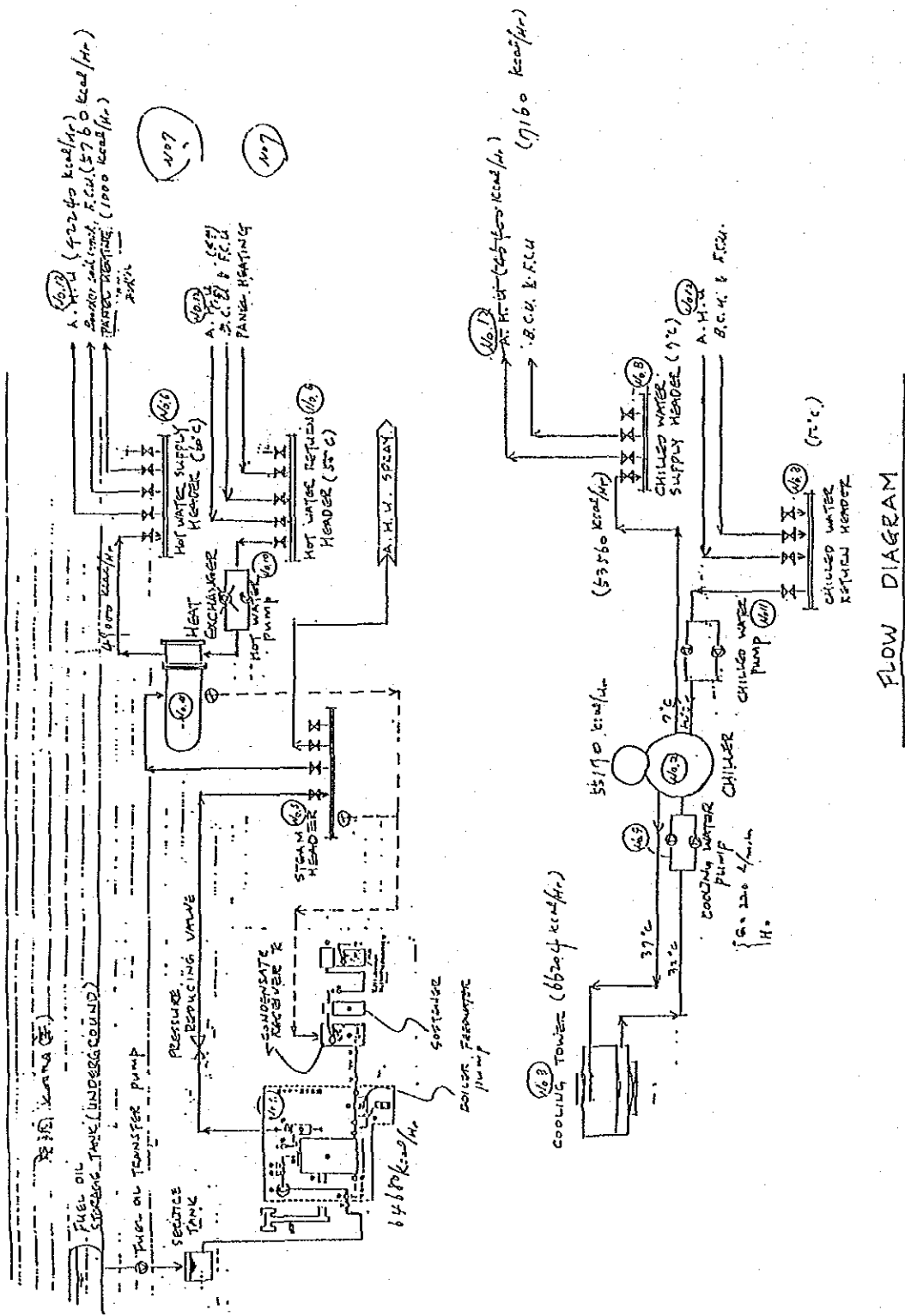
800mm → 600mm
650mm → 500mm
120mm → 100mm





交習室配管圖
SCALE 1/100

35x23 = 805 M² (244坪)



FLOW DIAGRAM

2. 年次別機材供与状況

1. 年次別機材供与状況

1. Precision measuring laboratory

No	Name	Descriptions	Q'ty	'86	'87	'88
①	Three Coordinate Measuring Machine	Measuring range: X-axis: 600mm : Y-axis: 450mm : Z-axis: 300mm Acc. Computer Micropack 210, X-Y Plotter, etc.	1	○		
②	Surface Roughness Tester	Rmax, Rz, Ra, RMS	1			○
③	Universal Gear Tester	Max. Out Dia. : 320mmφ Module: M1 - M7	1		○	
④	Tool Maker's Microscope	Micrometer stage; Size: 280 X 152mm	1		○	
5	Double Flank Gear Rolling Tester	Center Distance: 58 - 300mm	1		○	
⑥	Roundness Tester	Max. Measuring: 280mmφ	1			○
7	Air Gage Set	Standard Magnifying Power: 1000, 2000, 3000, 5000, 10000	1		○	

※ Noの○印はR Dに記載のものである。

※ '88の要検討は187の機材と関連のあるものである。

※ Nameの見消しは協議の結果削除したものである。

No.	Name	Description	Qty	Others
8 141	Three Coordinate Measuring M/C Accessories	.Interchangeable stylus for TP-1S φ 1.0, 1.5, 2.0, 4.0, 6.0, 8.0 .Taper probe; φ 2-φ 20 .Extension bar φ 14 .Contouring microscope 20x .Master ball .Optoeye M1 (detector)	Each 1 1set 1 1set 1set	MITUTOYO F-604
9 142	Electronic Level	Size : 225x 67x 125 Printer Type Capacity : 0.0025mm/m - 10mm/m	1set	
10 143	Height Micrometer	Range : 5-310 Type : Digital display (Built-in rotary encoder) Resolution : 0.001mm Head stroke : 20mm	2set	
11 144	Square Gauge Block	112pcs/set Grade : 0 class	1set	
12 145	Square Gauge Block Accessory	25pcs/set Grade : 0 class	1set	
13 146	Universal Height Micrometer	Range : 5-610 Type : Digital display Resolution : 0.01mm	1set	
14 147	Long Gauge Block	125mm, 150mm, 175mm, 200mm, 250mm	each 1set	

2. Pneumatic and hydraulic laboratory

No	Name	Descriptions	Q'ty	'86	'87	'88
1	Hydraulic Training Equipment Set	Contents of equipment pump, cylinder, valve etc	2	○		
2	Pneumatic Training Equipment Set	Contents of equipment Pump, cylinder, valve etc	2	○		
3	Air Dryer	Dryer for Pneumatic Training Equipment set.	1	○		
4	Electro-Hydraulic Servo Training System	Contents of equipment. Acc. Pump, Induction motor	1		○	

J. Machining shop

No	Name	Descriptions	Q'ty	'86	'87	'88
1	Universal Milling Machine	Travel Longi. 750mm Cross 270mm Vertical 400mm Table size 1,350 X 270mm Spindle Speed 68-1,760 rpm Acc. Machine Vice, Milling chuck, etc	2Set	○		
2	Universal Grinding Machine	Swing over table 300mm Distance Between center 400mm Table feed speed 50-4,000 rpm Grinding wheel 355 X 152 mm Acc. grinding Wheel balance stand, internal grinding attachment etc.	2	○		
3	Surface Grinding Machine	Travel Longi. 600mm Cross 300mm Distance between Wheel edge to top 347mm Grinding wheel 305mm Acc. Magnetic chuck Magnetic sine table etc.	1	○		
4	Engine Lathe	Swing over bed 470mm Swing over Carriage 240mm Distance between center 800mm Hole through spindle 54mm Spindle speed 50-1,500rpm Acc. 4-jaw chuck coolant system etc.	2	○		
5	Miscellaneous Tools	Cylinder gage. gage block set etc.	1Set	○		
6	Vertical Milling Machine	Travel Longi. 750mm cross 270mm vertical 400mm Table size 1,350 X 270mm Spindle taper NT 50 spindle speed 68-1,760rpm Acc. Digital read out, index head etc	3	○		

No	Name	Descriptions	Q'ty	'86	'87	'88
7	Surface Grinding Machine	Travel Longi. 600mm Cross 300mm	1		○	
8	Universal Tool Grinding Machine	Swing over table 250mm Distance between center 700mm	1		○	
9	CNC Lathe	Swing over bed 430mm Distance between center 600mm	1		○	
10	Engine Lathe	Swing over bed 470mm Distance between center 800mm	3 3/4			○
11	Band sawing Machine	Maximum cutting dia. 280mm	1		○	
12	Bench Drilling Machine	Drilling capacity 13mm	2		○	
13	Gear Hobbing Machine	Gear dia. 660mm Gear Pitch H 6	1			○
14	Cast Iron surface plate	Size 750 X 1,000 mm Flatness 0.03mm	4		○	
15	Drill Grinder	Max. drill dia 30mm	1			○
16	Upright Drilling Machine	Drilling capacity 40mm	1		○	
17	Vertical Milling Machine	Travel Longi. 750mm Cross 270mm Vertical 400mm Table size 1,350 X 270mm Spindle taper NTS 50 Spindle speed 68-1,760 rpm	2			○

4. Industrial Instruments laboratory

No.	Name	Descriptions	Q'ty	'86	'87	'88
(1-1)	Programmable Indicating Controller	SLPC-210*A/SPR Fluorescent bar graph	3	○		
		Programming chip 5191-501 For SLPC/SPR	3	○		
(1-2)	Programmer	SPRG-000*A For power source 100V	1	○		
(1-3)	Indicating controller	SLCD-230*B Fluorescent bar graph	3	○		
(1-4)	Operator Station (Operator's console)	UOPS-151*B/EKE/UPRT /HL English support With Engineer key board, Printer & HL Bus terminator	1	○		
(1-5)	Loop Display Unit	HLDU-220*B Fluorescent bar graph	1	○		
(1-6)	Field Control Unit	UFCH-110*A LCS X1 LCU X1 MAC2 X1 PAC X1 VM1 X1 VM2 X1 PM1 X1 ST2 X1 P85 X1	1	○		
(1-7)	Signal Conditioning Nests and Cards	CNH X1 CNU X1 Card: M1 x1, TS x1, RS x1, H1 x1, H5 x1, A1 x1, AS x1, CO x2, AO x2, HO x2, S1 x1, H2 x1, P1 x1 and Y1 x 1	1	○		
(1-8)	Cables and Other	Accessories for the above Item No. 1-1. to 1-7	1	○		

No	Name	Descriptions	Qty	'86	'87	'88
		Software: Package software: HSPD-101*A(English) x1 HINO-101*A(") x1 HINO-200*A(") x1 HBMD-101*A(") x1 HBMD-201*A(") x1 Application software:				
2	Model Plant of Auto- matic control System	Pressure controlled, Flow controlled, Temperature controlled System and level con- trolled system	1		○	
3	X-Y Recorder	Drive system: Automatic null-balancing DC servo mechanism Writing area: X-381mm Y-254mm Number of pen: 2-pen	2		○	
4	Logic Circuit System Trainer	Logical function panel Display panel Power supply panel Digital counter panel	5		○	
5	Oscilloscope	40 MHz, 2-channel	2		○	
6	Batch Controller	SLBC-200*B With Analog input/output	4		○	
7	EMF-and RTD-to-Voltage converter	STED-110-MV*B mV DC input	1		○	
		STED-210-TK*B Thermocouple input	1		○	
		STED-310-PA*B RTD input	1		○	
		STED-410-RS*B Potentiometer input	1		○	
8	Distributor	SGBT-111*B Loop isolation only	1		○	
		SGBT-211*B Field(Plus loop)isolation	1		○	

No.	Name	Descriptions	Qty	'86	'87	'88
9	Auto/Manual Station	SMST-111*B Push-button set point setting, 1 to 5V output	2		○	
		SMST-121*B Manipulated output lever, 4 to 20mA or 1 to 5V output	2		○	
10	Blending Controller	SLCC-200*B With communication function and Analog input/output	4		○	
11	Safty Barrier	BARD-200*A For use with thermocouple	1		○	
		BARD-400*A For use with 4 to 20mA loop of 2-wire transmitter/controller output	1		○	
12	Totalizer	STLD-200/MTS Totalizer with communication function	2		○	
13	Selector Station	SJBO-022*A/EWA02 Number of input: 16 " of output: 2 Input/Output signal: 1 to 5V DC	4		○	
14	Strip Chart Recorder	SRVD-220*B Input signal: Analog input 1 to 5V DC Alarm: High/Low limit alarms for 2-pen model	4		○	
15	Bar Graph Indicator	SIHF-110*A Input signal: Analog 1 to 5V DC Number of input: 1 input Alarm: 1 input, 2 alarms	4		○	
16	Microcomputer Application Training Board	All-in-one type, Settled in carrying case. Contents; Switch input circuit Sensor input circuit A/D Converter circuit DC Motor control circuit Buzzer circuit Cmos memory back-up circuit	5		○	

No.	Name	Descriptions	Q'ty	'86	'87	'88
17-1	Programable Indicating Controller	SLPC-210 ²⁵⁰ *E/SPR/MTS Fluorescent bar graph Programming chip 5191-501 For SLPC/SPR	3 3			○
17-2	Programmer	SPRG-000 *E For power source 100V	1			○
17-3	Indicating Controller	SLDC-010 *E/MTS Fluorescent bar graph	3			○
17-4	Operator Station (operator'S console)	Uops-151 *C/E/KE/HPRTVHL English support With Engineer key board, Printer & HL Bus Terminator	1			○
17-5	Loop Display Unit	HLDU-220 *E/MTS Fluorescent bar graph	1			○
17-6	Field Control Unit	UFCH-110 *E/ LCS-1 VM-1 LCU-1 VM-2 MAC-1 PM-1 PAC-1 ST2 PB-51 PBS/HL	1			○
17-7	Signal Conditioning Rack & Cards	CMH-A, CNU-A Card: CM1-A, CM5, CT5-TK, CA1, CR5, CA5, CS1 CPI, CH1, CCO, CH2, CAO, CHO, CX1	1			○
17-8	Cables and Other	Accessories for the above Item No. 17-1 to 17-7 Software: Pack Software UBPD-101-B(English) x 1 UIND-101-B(English) x 1 UIND-200-B(English) x 1 UBND-101-B(English) x 1 UBND-201-B(English) x 1 Option . UBND -300 x 1 } 追加分 . UCVD -100 x 1 } Application Software	1			○
18	Transmitter and SFC	• Transmitter spec. STD 120 Differential pressure to current Available range: 0-400 H ₂ O inches Minimum span adjustable: 1 H ₂ O inch Turndown ratio : 400:1 • SFC spec. STS100-006 Voltage Reference condition 25 ±0.05V Operating limits 10-42.4V	1 1	✓	○	○
19	Service kits	SSKD • Analog test unit input : 4-20mA output : 1-5V DC • Pulse interface unit • Test ROM : SLPC, SPLR	3	✓	○	○

No	Name	Description	Qty	'86	'87	'88
20 19	追加分 DC Voltage/Current Standard	D-12.000V DC in 4 Range D- 36 A DC in 7 Range MAX. out current 25mA Accuracy output : ± 0.005%	2			○
21 10	Digital Multimeter	Amps : InA -2A Ohms : 100 μΩ-200 KΩ DC Voltage: 1 μV- 1000V AC Voltage: 10 μV- 700V	2			○
22 11	Current to Pneumatic Converter	Input : 4-20mA Output: 0.2-1.0 Kg/cm ²	2			○
23 12	Test Switch & Lamp (16 Point UFCH Card 用)	TEST SW 16 point Lamp 16 個	2			○
24 13	Pneumatic Indicating Controller (Panel用)	Control Mode PID Air Supply 1.4-1.6 Kg/ cm ² Input signal 0.2-1.0 Kg/ cm ² Output signal 0.2-1.0 Kg/cm ² Alarm: Input (Low & High) with side Recorder	/			○
25 14	Pneumatic Recorder	Power : 100-120 VAC (60 Hz) Input signal 0.2-1.0 Kg/ cm ² Air supply 1.4-1.6 Kg/cm ² 2 pen	/			○
26 15	EPRON Eraser	10 Pieces of PRON can be erased at the same time	/			○

S. Electronic Instruments laboratory

No	Name	Descriptions	Q'ty	'86	'87	'88
①	Oscilloscope	DC-40MHz., 3-Channel 5mV/div-10V/div	20	○		
2	Digital Storage Oscilloscopes	DC - 100 MHz. 2 CH	1	○		
3	Spectrum Analyzer	Frequency Range: 10KHz. to 2 GHz. Measuring Level Range: -115 to + 20 dBm	2	○		
4	Pulse Generator	DC - 50 MHz. (20Hz. - 50 MHz) 0V- +10V (50 Ohm Load)	20	○		
⑤	Programmable Pulse Generator	100 MHz. 1.3 ns Variable Transition Time	1	○		
6	Precision Multimeter (Digital Multimeter)	DCV, ACV, Ohm, DCA, ACA 5 1/2 (Display) ACV F: 20Hz-250KHz	2	○		
7	Digital Multimeter	DCV, ACV, Ohm, DCA, ACA 4 1/2 (Display) ACV. F; 20Hz-100KHz	20	○		
8	Programmable Signal Source (RC Oscillator)	F: 0.001Hz. - 50kHz Waveforms : Sine, Square, Pulse, Ramp	2	○		
⑨	RC Oscillator	F : 10Hz-1MHz Waveforms: Sine, Square Sawtooth Wave	20	○		

No	Name	Descriptions	Q'ty	'86	'87	'88
⑩	Q-Meter	F:15.5KHz. to 50MHz., 7 Band Q Measurement 5 to 750	1	○		
11	VHF Q-Meter	F:20-230MHz, 4 Band Q-Measurement 10 to 750	1	○		
12	Logic Analyzer	100 MHz., 9-Channel Personality PROBS 8085A, Z80A	1	○		
13	AM/FM Standard Signal Generator	10 KHz. to 280 MHz.	1	○		
⑭	Universal Counter	1mHz. -150 MHz. Gate Time 1mS, 10mS, 0.1S, 1S, 10S	10	○		
15	Audio Sweep Oscillator	Swept Range:20Hz. to 20KHz. at X1, 200Hz. to 200KHz. at X2 Accuracy: Within $\pm 5\% + 2\text{Hz}$ With Manual Setting	1	○		
16	Audio Frequency Respo- nse Tracer	Frequency Range:Two, Range 20Hz. to 20KHz., 200Hz. to 200KHz.	1	○		
17	Precision Genescope	Plug-in type Sweep Output Level : 10 to 120 dB (A Block) 0 to 110 dB (B Block)	1	○		

No	Name	Descriptions	Q'ty	'86	'87	'88
18	Precision DC Potentiometer	1.5V Range-0.00010 to 1.6111V 0.15V Range-0.000010 to 0.16111V	1	○		
19	Digital LCR Meter	120KHz., 1KHz., 10KHz.	3	○		
20	High Speed X-Y Recorder	Size : A3.	1		○	
21	AM/FM Radio IF Sweep-scope (AM/FM IF Genescope)	A Band:400KHz. to 500KHz B Band:9.5MHz. to 11.5MHz	2		○	
22	AM/FM Radio/TV Sound Diginarscope (AM/FM Trackingscope)	For AM/FM Radio F : IF:455KHz, 10.7MHz AM:0.1 to 3MHz SW:1.5 to 30MHz PM,LOWTV:63 to 110MHz HighTV:168 to 227MHz	2		○	
23	Transistor Curve	Vertical axis : 1-2-5 Switchable Horizontal Axis :1-2-5 Switchable	2		○	
24	Wow Flutter Meter	3KHz. \pm 300Hz.	1		○	
25	Automatic Distortion Meter	2-Channel, 400Hz., 1,000 Hz. \pm 10%	1		○	
26	Audio Analyzer (Audio Measuring System)	5Hz. - 159.9 KHz.	1		○	

No	Name	Descriptions	Q'ty	'86	'87	'88
27	AM/SSB Transceiver	F:Range:TX:160-10Meter RX:150KHz-30MHz Mode :AM,SSB,CW	1		○	
28	FM Transceiver	F:Range1 :144.000- 145.995MHz Range2 :144.000- 147.995MHz	1		○	
29	Measuring Receiver (Field Strength Meter)	9KHz to 30MHz With Antenna	1		○	
30	Function Generator	0.1-10MHz	4		○	
31	VTR System	U-type(3/4 inch), NTSC	1		○	
32	Color TV Camera	NTSC, Color Video Camera (3/4 inch)	1		○	
33	Semiconductor Para- meter(Curve Tracer)	0.1V/div. - 200V/div. 11 Range	2		○	
34	Color Pattern Generator(PAL)	PAL Type	1		○	
35	Color Pattern Generator(NTSC)	NTSC Type	1		○	
36	Electronic Volt Meter	10KHz. - 1,000MHz	1		○	
37	Digital Memory Scope	2 μ .sec/word, 12bit/4096 word	1		○	

No	Name	Descriptions	Qty	'86	'87	'88
38	AC Voltage/Current Standard (AC Voltage/Calibrator Standard)	High accuracy: $\pm 0.08\%$ Output: 1mV to 1,200V in 6 ranges : 1mA to 60A in 4 ranges	1		○	
39	AM/FM Standard Digital Synthesizer	100KHz. - 1,300MHz	1		○	
40	Video Signal Measuring Instruments (Video Signal Analyzer)	TV System: 525/60 NTSC Input level: -6 to +6 dB With measuring instruments (Waveform monitor) (Color gain & delay test set) (Signal Generator)	2		○	
41	Waveform Monitor (Test Monitor)	NTSC	1		○	
42	Vectorscope	NTSC, Type: 150mm rectangular Acceleration voltage: 12KV	1		○	
43	Audio Metric Test Room	40dB(at 1,000Hz.) Size: 900(W),890(H),830mm	1			
44	Stereo Amplifier Test System	DC Level: 1-100V V.F.S				
45	Dual Tracking DC Power Supply	Output 0 - +35 V 0 - -35 V 3 A	20			

No	Name	Descriptions	Q'ty	'86	'87	'88
146	Regulated DC Power Supply	-Output Range : 0-8V, 0-10A 0-16A, 0-5A 0-35V, 0-2.5A 0-30V, 0-1A -Ripple : 300uVrms, (CV) 2mAcrs(CC)	6			
147	FM-AM Signal Generator	-Frequency Range : 100KHz-110MHz -Resolution : 100Hz, 1KHz -Modulation : AM, FM, FM stereo -Accuracy : $\pm 5 \times 10^{-5}$	1			
148	Precision Wheatston Bridge	-Measuring Range : 0.1000 Ω - 111.110K Ω (9Range) -Accuracy : 0.01% of setting -Galvanometer (built in) Bridge Power Source (built in)	1			
149	DC Meter	Potable Type	10			
150	AC Meter	Potable Type	27			
151	Insulation Tester	-Rating : 250V/500 M Ω 500V/1000 M Ω 2,000V/2,000 M Ω -Accuracy : $\pm 5\%$ Option Hard case, Probe case Probe No. 2, 3, 4, 5	1			
152	AC Level Meter	DC 0-01dB AC 10Hz-1MHz	1			
153	Power Supply	Output 0-35V 0.2-5A	20			
154	RF Power Meter	10MHz-140GHz	1			
155	Electronic Voltmeter	-Frequency : 10KHz to 1000KHz -Voltage Measuring : 300uV to 3V (8 Range) Range Option Voltage Divider, Termination etc	20			0
156	Tracking Generator	10KHz to 1.3GHz	2			

No	Name	Descriptions	Q'ty	'86	'87	'88
57	Audio Liner Amplifier.	f: 10KHz-1.3GHz	2			
58	Shield Room	0.5MHz-250MHz 2960(D)x3940(W)x1980(H) line Filter load: .1KW	1			
59	Oscilloscope Calibrator	-Output Voltage : 0.12eV to 60V 0.2mV to 100V (18steps) -Output Waveform : square wave -Rise Time : 5us or less -Output Frequency : 0.5Hz - 1MHz (20steps)	1			
60	Field Strength Meter	F-Range : 25MHZ-300MHZ. Display : LCD 4 Digits. Monitor Out : AM,FM GP-IB Interface. Dipol ANT Set 25-300MHZ.	1		○	
61	Digital Plotter	25 μ m Step. 8 pens. Max. Plotting Area : 400x275mm. Interface:RS232C,GP-IB. Writing Speed : MAX. 400mm/S.	1		○	
62	Communication Receiver	F-Range : 150KHZ-30MHZ. Mode : AM, FM, SSB, CW Sensitivity : SSB/CW : Less than 2 μ V AM : Less than 20 μ V FM : Less than 2 μ V Selectivity : Wide : 30KHz-at-50dB Narrow : 2.7KHz at-6dB	1		○	
63	Oscilloscope	DC-200MHz 4CH 8Traces. CRT : 6 Inch Rectangular. Rise Time : 1.75 nS. Combination Trigger Probe	1		○	
64	Synthesizer Function Generator.	DC-20MHz, GP-IB. 100 Step Memory. Accuracy : Less than 2%.	1			

No.	Name	Description	Q'ty	'86	'87	'88
65	Precision Wheatstone Bridge	-Measuring Range : 0.1000Ω - 111.110HΩ (0Range) -Accuracy : 0.01% of setting -Galvanometer (built in) Bridge Power Source (built in)	1set			○
66	Logic Analyzer	-Frequency Range : 200MHz -95 Input Channel (Max) -3 Independent Time Axes -3ns glitch Detection -set-up Condition Store/recall -Hard Copy Function -5ns Resolution (200MHz) <u>Optional Accessories</u> -Sync analyzer SL-0220 -GP-IB card SL-0223 -Personality probe adapter SL-0223 -8-bit personality card SL-0227 -Probes : SL-031 or SL-0025 or SL-0024 or SL-0013 or SL-0012 or SL-0011 or SL-0010.	1set			○
67	Sampling Scope	-Frequency Range : DC-12.4 GHz-3dB :DC-3.5 GHz-3dB -Sensitivity : 2mv/div-200mv/div -Input Channel : 2 Channels -Sweep time : 20ps/div-50us/div 1-2-5 sequence -Sampling frequency : MAX. 70KHz -Wave form memory : 3.5inch FDD <u>Option</u> -3.5inch FDD SE-3101 -Dummy case -HF sync probe -Input probe SFP-3A, HZ-501A, 502A	1set			○
68	CRT Read Out Oscilloscope	-Frequency Range : DC-100MHz -4 Channel Input and Cursor Measurement -Jitterless Circuit for Stable Triggering -20Kv High Acceleration Voltage -Comment Display : MAX 80 Characters -Delay Time Range : 0.20-10.20div <u>Option</u> -Current Probe (1) - " Termination (1) - " Amplifier (1) -High Voltage Probe (1) -Viewing Hood B (1) -High Voltage Dividers (1)	1set			○

No.	Name	Description	Q'ty	'86	'87	'88
L5/ 69	Oscilloscope Calibrator	-Output Voltage : 0.12mV to 60V 0.2mV to 100V (18steps) -Output Waveform : square wave -Rise Time : 5us or less -Output Frequency : 0.5Hz - 1KHz (20steps)	1			○
L6/ 70	Electronic Volt Meter	-Frequency : 10KHz to 1000KHz -Voltage Measuring : 300uV to 3V (8 Range) Range Option -Voltage Divider 100:1 and 2pF Probe tip type (100 KHz to 200KHz) -Coaxial T Connector N female (10KHz to 1000KHz) -Termination 50Ω N female (10KHz to 1000KHz) -Termination 50Ω BNC female (10KHz to 1000KHz) -Termination 75Ω BNC female (10KHz to 300KHz)	10set (1) (1) (1) (1) (1)			○
L7/ 71	FM/AM Standard Signal Generator	-Frequency Range : 100KHz-110KHz -Resolution : 100Hz, 1KHz -Modulation : AM,FM,PM stereo -Accuracy : $\pm 5 \times 10^{-5}$ (FM) -Frequency Deviation : 0-99.5KHz carrierfreq. x 10% -Resolution : 0.5KHz -Accuracy : Max value $\pm 10\%$ (STEREO SIGNAL) -Separation : 55dB (400Hz - 1KHz) -Pilot Signal : 10KHz ± 2 Hz (AM) -Modulation factor : 0-60% -Resolution : 0.5% -Accuracy : $\pm 5\%$	1set			○
L8/ 72	Dual Tracking DC Power Supply	-Output Voltage : 0- +35V, 0- -35V -Ripple : 0.5mVrms -Line, Load Effect : 0.005% +1 -Output Current : +3A, -3A	5			○
L9/ 73	Regulated DC Power Supply	-Output Range : 0-8V, 0-10A 0-16A, 0-5A 0-35V, 0-2.5A 0-30V, 0-1A -Ripple : 300uVrms, (CV) 2mArms(CC)	4			○
L10/ 74	Personal Technical Controller	It consist of -Controller main unit KC 1202A -Color display monitor KC 3602A -ASCII key/board KC 3302A	1system			○

No.	Name	Description	Q'ty	'86	'87	'88
		<ul style="list-style-type: none"> -House Controller MC0304A -House MC3304A -GP-IB Interface MC0175A -General Purpose I/O Interface MC0170A -A/D Converter MC0131A -D/A converter MC0132A -Hard disk Interface MC0178A -Printer DPR7713A -2K-byte RAM. MC0110A -Expansion box Interface MC0101A -Hard disk drive MC2201B -Printer Interface MC0174A -Standard software OS, BASIC, File manage, file converter, hardware diagnostic program -Libraries Statics I (HX5221A), II (HX-5222A) FFT (BASIC) (HX-5223A), Array Function (HX-5225A), Mathematics Function (HX-5220A), Assembler System (HX-5201A), FFT (Assembly Language) (HX-5224A) -Option -Expansion Box MC3101A -Expansion Box Interface MC0801A -1MByte RAM OPT03 				
4-4 75	AC Automatic Voltage	<ul style="list-style-type: none"> -Thuristor phase control type -Output voltage : 1 ϕ, 100V \pm 2% 2KVA -Frequency distortion : 60Hz 3% -Response speed : 200ms -Built-in protection circuit -Input voltage : AC100V \pm 15% 	1			○

No.	Name	Description	Q'ty	'86	'87	'88
U-21 76	DC Meter	<u>Portable DC Standard V-Meter</u> -Principle : Moving Coil type (taut band) -Rated Accuracy : $\pm 0.5\%$ of full scale -Measuring Range : 0.3/1/3/10V (2) 3/10/30/100V (3) 30/100/300/1000V (1) 3V (1) <u>Portable DC Standard A-Meter</u> -Principle : Moving Coil type (taut band) -Rated Accuracy : $\pm 0.5\%$ of full scale -Measuring Range : 3/10/30/300 uA (1) 10/30/100/300 uA (5) 0.1/0.3/1/3 mA (1) 1/3/10/30 mA (2) 10/30/100/300 mA (4) 0.1/0.3/1/3 A (2) 1/3/10/30 A (2)	7			○
		<u>Portable DC standard V-A Meter</u> -Principle : Moving coil type (taut band) -Rated Accuracy : $\pm 0.5\%$ of full scale -Voltage Range : 3/10/30/100/300/ 1000V -Current Range : 1/3/10/30A 1/3/10/30/100/300mA	2			○
V-3/ 77	AC Meter	<u>Portable AC Standard A-Meter</u> -Principle : Moving Coil type (taut band) -Rated Accuracy Range : $\pm 0.5\%$ of full scale -Measuring Range : 20/50/100/200mA (2) 0.5/1/2/5 A (1) 10/20/50/100 A (1)	4			○
		<u>Portable AC Standard V-Meter</u> -Principle : Moving Coil type (taut band) -Rated Accuracy : $\pm 0.5\%$ of full scale -Measuring Range : 15/30V (2) 75/150V (1) 150/300V (1)	4			○
		<u>Portable AC Standard V-A Meter</u> -Principle : Moving Coil type (taut band) -Rated Accuracy : $\pm 0.5\%$ of full scale -Voltage Range : 30/75/150/300/750V -Current Range : 0.15/0.3/0.75/1.5 3/7.5/15/30A	2			○

No.	Name	Description	Q'ty	'86	'87	'88
44 78	Insulation Tester	-Rating : 250V/500 K Ω 500V/1000K Ω 2,000V/2,000 K Ω -Accuracy : $\pm 5\%$ Option -Hard case -Probe No. 2 -Probe case -Probe No. 3 -Probe No. 5 -Probe No. 4	1 (1) (1) (1) (1) (1) (1)			○
45 79	Audio Amplifier	-Tuner : AM 535-160KHz FM 88-108KHz -Power Output : DC - 200KHz 150W + 150W stereo THD 0.001% -Receiver type Amp.	1			○
46 80	DC Precision Supply	For Precision DC Potentionmeter 272200 YEW -Output Current : ± 1 to 165mA DC (max. output 10V DC) -Stability : ± 5 ppm/10 minutes ± 20 ppm/hour ± 20 ppm/ $^{\circ}$ C	1			○
47 81	Voltage Ratio Box	For Precision DC Detentionmeter 272200 YEW -3/7.5/15/30/75/150/300/750/1500V -Accuracy : ± 0.01 or $\pm 0.02\%$	1			○
48 82	Standard shunt	-For Precision DC Portentionmeter 272200 YEW -Shunt 2A -Shunt 5A -Shunt 10A -Shunt 20A -Shunt 50A -Shunt 100A -Accuracy : $\pm 0.05\%$	6 (1) (1) (1) (1) (1) (1)			○
49 83	Standard Resistor	For Precision DC Potentionmeter 272200 YEW -0.001 Ω , 0.01 Ω , 0.1 Ω , 1 Ω , 10 Ω , 100 Ω , 1K Ω , 10K Ω , 100K Ω 1M Ω ,	10 (each1)			○
49 84	DC Power Supply	For Measuring Receiver M.5218 Anritsu -Contains 12V, 7.5Ah Charger	1			○
421 85	Attenuator	-Frequency Range : DC-150KHz -Variable Tange : 0-121dB 0.1dB step -Type : Balanced Unbalanced	10 (5) (5)			○
422 86	Portable Audio Frequency Voltmeter	-Principle : Moving coil type with rectifier -Rated Accuracy : $\pm 0.5\%$ of full Value at 45Hz to 10KHz -Range : 30/75/150/300V -Scale length : Approx 135mm -Scale Division : 150 -Deflection Angle : 85 $^{\circ}$	1			○

No.	Name	Description	Q'ty	'86	'87	'88
12-3/ 87	Portable High-frequency Ammeter	-Principle : Moving coil type taut band suspension system with self-contained vacuum couple -Frequency coverage : DC, 10Hz-5MHz -Rated accuracy : $\pm 1.0\%$ of full scale value at 50Hz -Frequency influence : Max 1.0% -Range : 5/10/20/50mA	1			○
12-4/ 88	Portable High Frequency Voltmeter	-Principle : Moving Coil type taut band suspension system with self-contained vacuum couple -Rated Accuracy : $\pm 0.5\%$ of full scale value at 50Hz -Frequency Influence : MAX 1.0% -Range : 15/30/75/150V -Frequency coverage : DC, 10Hz-100Hz	1			
12-5/ 89	Portable wattmeter	-Principle : Electrodynamometer type -Rated Accuracy: $\pm 0.5\%$ of fullscale value -Frequency Range : DC, 25 to 1000Hz -Voltage Range : 120/240V -Current Range : 5/25A	1			○
12-6/ 90	Reference Oscillator	For synthesized signal generator MG655A ANritsu -Aging rate : $5 \times 10^{-4} \text{ } ^\circ / \text{day}$	1			○
12-7/ 91	Hard Copy	For Logic Analyzer -SL-4601 Iwatsu	1			○
12-8/ 92	DC Power Supply & DC cable	For FM Transceiver TH2550A KENWOOD -DC13.8 VDC at 10A	1			○
12-9/ 93	DC Power supply	For communication Receiver R-5000 KENWOOD	1			○
13-0/ 94	LoopANT with Tripod	For measuring Receiver ML521B Anritsu Measuring Range : 25 to 230MHz -Type : LoopANT -Tripod	2 (1) (1)			○

6. Machinery design room

No	Name	Descriptions	Q'ty	'86	'87	'88
①	Drafting Machine and stand	Drafting machine 750 X 1,050 mm Drafting board Drafting stand	100	○		
②	CAD/CAM	1) Computer GRADE mini II CPU : 16 Bit Memory 1.25MB Clock 8 MHz CRT 14" color Floppy disk 5.25" Tablet rang 391 X 391mm ACC. X-Y Plotter, printer, tape puncher etc.	2	○		
3	CAD/CAM	Computer GRADE mini II CPU - 16 Bit Memory 1.25 MB clock 8MHz CRT 14" color Floppy disk 5.25" Tablet rang 391 X 391 mm	4			
④	Drafting H/C for blackboard	Board size 900 X 1,800mm	1		○	
⑤	Blue printing Machine	A1 Size	1		○	
6	Revolutionary Opaque Projector	.Aperture : A4 size .Luminous : 200 Lumens or more .Magnification : Approx. 8x .Power supply : 110V, 60HZ	1		○	

No.	Name	Description	Q' ty	Others
7	CAD/CAM System	<p>o HARDWARE</p> <ol style="list-style-type: none"> 1. CPU : 32bit, 0.9MIPS, FPU 2. MEMORY : 8MB 3. KEYBOARD: ASCII KEYBOARD 4. CRT : 19" COLOR 5. HARD DISK : 160MB 6. TABLET 7. PRINTER : 24X24 OR MORE THAN <p>8. COMPUTER FOR D.N.C.</p> <ul style="list-style-type: none"> - CPU : 16 bit - MEMORY : 1MB - DATA COMMUNICATION SYSTEM <p>9. N.C MACHING FOR EDUCATION</p> <p>o SOFTWARE</p> <ol style="list-style-type: none"> 1. GENERAL SOFTWARE FOR E.W.S <ul style="list-style-type: none"> - 3-D CAD/CAM GENERAL SOFTWARE - OS SYSTEM (UNIX) - FORTRAN 77 - DNC SOFTWARE - DATA BASE - C-COMPILER 2. BASIC COMPILER 3. MECHANISM MOTION ANALYSIS 4. MOLD DIE DESIGN SOFTWARE 5. SOFTWARE FOR TRANSRATION FROM 3-D MEASURING M/C CODE TO N.C 	<p>3</p> <p>1</p> <p>1</p> <p>Each 1</p>	<p>SOFTWARE IN-CLUE</p>

7. Material testing laboratory

No	Name	Descriptions	Q'ty.	'86	'87	'88
①	Hydraulic Universal Testing Machine	Capacity: 30tf Max.tensile space: 800mm Max. bending span: 500mm Acc. X-Y Recorder. Elongation Transducer for recorder etc.	1	○		
②	Rockwell Hardness Tester	200 X 450 X 655mm. (work space) Test Load: 60, 100, 150Kg Height of test piece: 0-200mm	1	○		
3	Brinell Hardness Tester	Capacity: 3,000Kg Variable Load: 500,750, 1000, 1,500, 2,000, 2,500Kg	1	○		
4	Micro-vickers Hardness Tester	Test Load: 10,25,50,100,200, 300,500,1000 Accuracy: Better than $\pm 1\%$	1	○		
5	Shore Hardness Tester	195 X 415 X 245mm (Net Weight) 16Kg (Gross Weight) 30Kg	1	○		
6	Vickers Hardness Tester	Test Load: 1,5,10,20,30,50kgt 260(W) X 500(D) X 750(H)mm 45Kg	1	○		
⑦	Charpy's Impact Tester	Capacity: 30Kg Swing angle: 146°	1	○		
⑧	Rotary Bending Fatigue Testing Machine	Capacity: 10Kg Loading range: 0-10Kg	1		○	
9	Torsion Testing Machine	Auxiliary Measuring: 25Kg.m Capacity : 10Kg.m	1		○	
10	Dynamic Amplifier & Recorder	No. of measuring points: 1 (multi-channel package possible)	1		○	
11	Strain Meter	Data Logger	1		○	
12	Magnetic particle Tester	200V 30A DC2000A AC1500A	1		○	
13	Ultrasonic Tester	DAC Circuit, A-Scope Recording Output Circuit and B-Scope Recording output Circuit	1		○	

No	Name	Descriptions	Q'ty	'86	'87	'88
14	Sparktest Specimen	JIS G 0566-1980	1		○	
15	Rockwell Hardness Tester	200 X 450 X 681mm (Work space) Test Load: 60, 100, 150Kg Height of test piece: 0-200mm	1			
16	Brinell Hardness Tester	Capacity: 3,000Kg Variable Load: 500, 750, 1,000, 1,500, 2,000, 2,500Kg	1			
17	Micro-vickers Hardness Tester	Test Load: 10, 25, 50, 100, 200, 300, 500, 1000 Accuracy: Better than $\pm 1\%$	1			
18	Shore Hardness Tester	195 X 415 X 245 mm (Net Weight) 16Kg (Gross Weight) 30Kg	1			
19	Vickers Hardness Tester	Test Load: 1, 5, 10, 20, 30, 50 Kgf 260(W) X 500(D) X 750(H)mm 45Kg	1			

8. Die and mold machining shop

No	Name	Descriptions	Q'ty	'86	'87	'88
1	Vertical Milling Machine	Travel Longi. 750mm Cross 270mm Vertical 400mm Table size 1,350 X 270mm Spindle taper NT 50 Spindle Speed 68-1,760rpm ACC. Milling Vise; Milling Chuck etc.	3	○		
2	Form Grinding Machine	Table working surface 500 X 200mm Table longi. 600mm Table cross 215mm Size of table 550 X 220mm ACC. Magnetic Chuck, grinding balancing stand etc.	2	○		
3	Engraving Machine	Size of pantagraph Size of work table 300 X 200mm Spindle speed 4,200 - 16,000 rpm Spindle dia. 32mm	1	○		
4	Contour Machine	Capacity height 500mm throat 350mm Table size 700 X 700mm Welder 3 KVA	1	○		
5	NC Automatic Programming unit	CPU 16bit micro computer keyboard CRT 9.5" Mini-floppy disk 5" ACC. Plotter, software etc.	2	○		
6	Filing Machine	Cutting capacity 500 X 150mm File speeds 10-65m/min Table size 500 X 500mm Acc. File band etc.	2	○		
7	Jig Grinding Machine	Table travel 400mm saddle travel 250mm Work surface 600 X 320mm Spindle speeds 5-300 rpm Grinding speeds 9,000-45,000	1	○		

NQ	Name	Descriptions	Q'ty	'86	'87	'88
		Acc. Circular dividing Table, Tilting rotary table, etc.				
8	Air Tools	Air hand tool for diemaking	1	○		
9	Profile Grinding Machine	Grindable size 250 X 100 X 130mm Screen size 500 X 500mm Magnification 50X, 25X Working surface of table 400 X 250mm Grinding head speed 1,000 X 4,000 rpm Acc. Cylindrical grinding att., Magnetic chuck, etc.	1	○		
10	Miscellaneous Tools	Micrometer test indicator etc.				
11	Die set	Standard type for mold.	2	○		
12	Die and mold	Teaching material	2	○		
13	Power press	Capacity 60ton Stroke length 120mm No. of stroke 80 spm Acc. Foot switch safety device, etc. (Air Clutch Type)	1	○		
14	Profile projector	Screen dia. 350mm Magnification 5x, 10x, 20x, 50x	1		○	
15	Hydraulic Molding Press	Clamping capacity 30ton Working height 800mm	1		○	
16	NC Wire cutting Machine	Travel Longi. 250mm cross 350mm vertical 120mm Auto programming unit, puncher, reader etc.	1		○	
17	CNC Milling Machine	Working surface size 1,400 X 400mm Spindle speed 40-2000rpm	1		○	
18	NC Electric Discharge Machine	Work table size 700 X 400mm Table travel X axis 450mm " Y " 350mm	1	○		

No	Name	Descriptions	Q'ty	'86	'87	'88
19	NC Copy Milling Machine	Table Max. movement (X, Y, Z) 850 X 500 X 400mm Spindle speeds 40-2,000rpm	1			
20	Jig Boring Machine (Digital type)	Table travel 600mm Spindle head travel 400mm	1			
21	Injection Molding Machine	Screw dia. 52mm Hopper capacity 60 l	1		○	
22	Lifter	Standard type 100kg. W.				
23	Machining Center	<ul style="list-style-type: none"> . Table working surface 1,100 x 420 mm . Table max. travel (x,y,z) 760 x 430 x 510 mm . Spindle taper JIS No. 40 . Spindle speed 10 - 4,000rpm . Spindle motor AC 5.5kw (cont.) 7.5 kw (30min, rate) . Hydraulic motor 1.5kw - 4P . Tools Storage Capacity 20tool . NC Unit FANUC 11H-A . Acc. Tooling set. etc. 	1			○
24	FANUC PROGRESSIVE DIE CAD/CAH SYSTEM	<ul style="list-style-type: none"> System . 20" CRT and tablet . FANUC PROGRAM FILE . XY Plotter . Software for Progressive Die 	1			○

9. Air conditioning laboratory

No	Name	Description	Qty	'86	'87	'88
①	Car Air-con. Training Unit	Electric motor driven Complete with Compressor, Control device and other. Capacity: 5,000 Kcal/h.	1	○		
②	Sequence Training Unit	Motor direct starting Circuit and others	5	○		
3	"	ON-OFF Circuit and others	5	○		
4	"	Timer Circuit and others	5	○		
⑤	Air-Con. Experiment Unit	Electric circuit experiment panel including graphic panel and others	1	○		
6	Building Model Unit	Drainage chamber, Drainage pump and other	1	○		
7	Water Supply/Drain Unit	Level control, Water supply and others	1	○		
⑧	Constant Temperature /Humidity Device Training Unit	Air cooled compressor 400W R-12 TH-1041	2	○		
⑨	Refrig./Air-Con. Training Unit	Aircooled Type R-12 400W	1	○		
10	Open Type condensing Unit	Air Cooled Type R-12 400W	1	○		
11	Compressor for above	Compressor for the above Open type air-cooled type condensing unit	2	○		
12	Cut Model	Cut model of compressor for Open type condensing unit	1	○		
13	Refrigeration Trainer unit	Water-cooled Open type R-12, 2.2KW Complete with control panel	1	○		
14	"K" Factor Meter	38-35°C, 55-52°C	1	○		
15	Pressure Transducer	2 Kg/cm ²	1	○		
16	"	10 Kg/cm ²	1	○		

(No)	Name	Description	Q'ty	'86	'87	'88
17	Differential Pressure Transducer	1 Kg/cm ²	1	○		
18	"	20Kg/cm ²	1	○		
19	Digital Multimeter	DC, AC, Volt/Current	2	○		
20	CO Gas Analyzer	Infrared type	1	○		
21	CO ₂ "	Electric type	1	○		
22	Spot Welder	100 KVA	1	○		
23	MIG " (CO ₂)	AC 1,500A	2	○		
24	TIG "	200A	1	○		
25	Pipe Threading Machine	Oster 114R(1/2"-2") Babyread 2R4(1/2"-1/4")	1 1	○ ○		
26	Tools for Pipe Threading	2R-4, 10R, 117R	5	○		
27	Electric Pipe Threading Machine	Portable type 1/2"-2"	1	○		
28	Double Head Grinder	255mm, 0.75KW With dust collector	2	○		
29	Hydraulic Pipe Bender	Steel Pipe(1/2"-2")	1	○		
30	Shearing Machine	590mm, 7.5 HP	1	○		
31	Pipe Cutter	1/8"-2"	2	○		
32	Hack Saw Machine	Round: 200mm square: 180 X 180mm Motor; 0.75KW				
33	Universal Folding Machine	2.0mm (t) X 1.250mm	1	○		
34	Dew Point Meter	AC 100V±10V 60HZ 10-40°C DC 0-1V	1	○		
35	Pipe Bender	Copper Pipe (3/16", 1/4", 5/16", 3/8") (4 Size Bender	5	○		
36	" (Ratchet)	3/8 - 3/4	2	○		
37	"	1/4, 3/8, 1/2, 5/8, 3/4 (20PCS)	1	○		
38	T-making Tool	3/8 - 3/4	2	○		

No	Name	Descriptions	Q'ty	'86	'87	'88
39	Swaging Tool	1/4" - 5/8"	5	○		
40	Pipe Cutter	Copper Pipe 6-65mm	5	○		
41	"	3-28mm	5	○		
42	"	2-24mm	5	○		
43	Flare-Cutter Tool set	3/16" - 5/8"	5	○		
44	Flare Tool Set	3/16" - 3/4"	5	○		
45	LPG-Welding Torch	LPG 18#, 21#, 25#	5	○		
46	Electrical Brazing Set	15A	2	○		
47	Gage manifold set	set 14L/min, Presser 0-30kg/cm ²	5	○		
48	Charge System set	Vacuum Pump gage manifold charge hose	2	○		
49	Charge Cylinder		2	○		
50	Charge		5	○		
51	Valve Wrench		5	○		
52	Torque Wrench	1/4" Flare nut	5	○		
53	Torque Wrench	3/8" Flare nut	5	○		
54	Pulley Puller	75 - 220	4	○		
55	Bearing Puller		1	○		
56	Expansion Valve	Flare Type R-12 (0.5°, 10.3°)	5	○		
57	Suction Pressure Regulating Valve	1/2" (x-12)	2	○		
58	Evaporative Pressure Regulator	1/2"	2	○		
59	"	5/8"	2	○		
60	Magnetic Valve	Freon Refrigerant Flare Type 1/2"	3	○		
61	"	" 5/8"	3	○		
62	Thermister Thermo-Meter	4 Point type -30-170°C With Sensor	1	○		

No	Name	Descriptions	Q'ty	'86	'87	'88
63	Pocket Thermo-Meter	-50-100°C	2	○		
64	Universal Test Set	Electrical Type	1	○		
65	Anemometer	0-5, 0-40m/s 0°-80°C	1	○		
66	Refrigerant Leak Detector	Propan (LPG)	5	○		
67	Halogen Leak Detector	(H) 2-5 g/gear	1	○		
68	Noise Level Meter	Portable type 80-120dB	1	○		
69	Circuit Tester	100KΩ/V 10μA	5	○		
70	Clamp Meter	6/15/60/150/300A 150/300/600V 1KΩ	2	○		
71	Insulate Resistor	100V 200MΩ (AC adapter)	1	○		
72	Rotary Meter	100/200/500/1000/2000/5000/10000 R.P.M Contact Type	1	○		
73	"	" (Noncontact)	1	○		
74	Vacuum Gauge	0-50 mm Hg (Electronic Type)	2	○		
75	Temperature, Humidity (Self) Recorder	-20-100°C, 100%	1	○		
76	Digital Hygro-Meter	100%	2	○		
77	Vacuum Pump	50L/min	4	○		
78	"	100L/min	1	○		
79	Low Pressure Control S/W	500 mV - 60Kg/cm ²	2	○		
80	High Pressure Control S/W	Auto	5	○		
81	"	manual	5	○		
82	Thermal Control S/W	-20 - +20°C	5	○		
83	Defrost Timer	24H	1	○		
84	Magnet S/W	(0.75KW, 15KW) AC 240V 60HZ	4	○		
85	Filter Dryer	3/4"	2	○		
86	"	5/8"	2	○		

No	Name	Descriptions	Q'ty	'86	'87	'88
87	Packless Valve	Freon flare type straight (1/4", 3/8", 1/2", 5/8")	5	○		
88	Stop Valve	Freon Flare Type 1/4", 3/8", 1/2", 5/8"	5	○		
89	Packed Valve	1/2"	2	○		
90	"	5/8"	2	○		
91	Service Valve	1/2"	2	○		
92	"	5/8"	2	○		
93	Level Control	Float, Oil level Regulator	1	○		
94	Accumulator		1	○		
95	Liquid Receiver	2 HP - 3 HP	1	○		
96	Oil Separator	OUB 1- OUB 4	1	○		
97	Constant Pressure Expansion Valve	R-12 0.8-2.8Xg/cm ² 0.3, 1.2 USRT	6	○		
98	"	R-12 350cmV - 3.5Xg/cm ² 0.5USRT, 2, 4	6	○		
99	Hand Expansion Valve	R-12 0.3 USRT	2	○		
100	"	" 2 USRT	2	○		
101	Three Way Valve	2.4 ² , 120V 60 HZ	1	○		
102	Four Way Valve	1.3t 120 ^V , 60	1	○		
103	"	3t	1	○		
104	Differential Pressure Control S/W	0.2min - 2 max Xg/cm ² Freon	1	○		
105	"	0.5min - 2max "	1	○		
106	Room Humidity Control S/W	10 - 90 %	1	○		
107	Flow Control S/W	4 - 10 L/min 1/2"	1	○		
108	Tool Set	Adjustable Wrench, But 21 Kinds	4	○		
109	Wiring Tool Set	Terminator Bench, But 15 Kinds	4	○		

No	Name	Descriptions	Q'ty	'86	'87	'88
110	Semi-Hermetic Condensing Unit	Air-cooled type 3.0 KW R-12	1	○		
111	Compressor for the Above	Compressor for the above semi-hermetic air-cooled type condensing unit.	1	○		
112	Cut Model	Cut model of compressor for semi-hermetic condensing unit	1	○		
113	Enclosed type condensing unit	Enclosed type condensing unit 0.4KW, R-12	1	○		
114	Cut Model	Cut model of compressor for Enclosed type condensing unit	1	○		
115	Cleaner	for air conditioning	1	○		
116	Heat Exchanger	HE-15	1	○		
117	Boiler	Capacity: 100Kg/h	1			○
118	Refrigerating Machine	Capacity: 40,000 Kcal/h	1			○
119	Cooling Tower	Blower: 0.4KW, 3-phase 220V	1			○
120	Heat Exchanger	Capacity of heat exchange: 85,000 Kcal/h	1			○
121	Steam Header	100A X 1,000L	1			○
122	Hot Water Header	100A X 1,500L	2			○
123	"	50A X 700L	2			○
124	Cooling Water Header	100A X 1,400L	2			○
125	Oil Pump	Capacity: 8 L/min. X 0.2 KW, 3-phase 220V	1			○
126	Cooling Water Pump	164 L/min. X15m	1			○
127	"	128 L/min. x 20m	1			○
128	Hot Water Pump	155 L/min. x 20m	1			○
129	Circulation Pump	60 L/min. x 10m	2			○
130	Air Conditioning Unit	Horizontal handling unit	1			○

No	Name	Description	Q'ty	'86	'87	'88
131	Booster Coil unit	Blower: 1,000 m ³ /h	1			○
132	Fan Coil unit	Floor open type	1			○
133	"	Floor concealed type	1			○
134	"	Ceiling open type	1			○
135	"	Ceiling concealed type	1			○
136	Packaged type Air Conditioner	Wall mounting Heat-Pump type	1			○
137	Circulation Blower	6,700 m ³ /h. X 45 mmAq	1			○
138	Blower	Capacity: 21/2 X 700 ³ /h. X 32mmAq X 3.7KW 3 phase 220V	2			○
139	<u>Supply Blower</u>	Dia. of ventilation: 250mmφ	2			○
140	Exhaust Blower	Capacity: 21/2 X 7,000 ³ X 32mmAq X 3.7KW 3 phase 220V	1			
141	"	Dia. of ventilation: 250mmφ	1			
142	Air-Conditioning	The control panel for the above Items No.117,119 and 131 to 141	1			○
143	Electric Power Source	The control panel for the above Items No.117, 119 and 131 to 141	1			○
144	Central control panel System	The control panel system for the above all equipments	1			○
145	Steam cleaner	200 L/hour 110V, 60HZ, 7A	1		○	
146	Service-Can Valve		5		○	
147	Building Emergency Control System	Smoke Detecting system, but 3 Kinds.	1		○	
148	Air con. Equipment unit	Electric circuit exp. panel including graphic panel & others	1			
149	Building Model unit	Drainage chamber, Drainage pump & others	1			
150	Water supply/drain unit	Level control, Water supply & others	1			

No	Name	Descriptions	Q'ty	'86	'87	'88
151	Cooling/Heating unit	compressor, cooling tower others	1		○	
157	Electric Pipe threading M/C	Portable type : 1/2"-2"	2		○	
158	Hydraulic Pipe Bender	Steel pipe (1/2"-2") Bending angle : 0-90°	1		○	
159	Pipe Cutter	Copper pipe: 6-65mm	5		○	
160	Universal test set	Electrical type	1		○	
161	Air Conditioning Laboratory Unit	1) Air supply unit Max. flow rate : 1000kg/h 2) Primary heating unit 3) Humidifier unit 4) Observation chamber (1st) 5) Cooling unit 6) Reheating unit etc.	1		○	
162	Air Conditioning Simulator Unit	A simulator for learner to develop a systematic approach trouble shooting technics about a typical air conditioner mechanical and electrical system Malfunction : 24 AC 110, 60HZ, 1 φ	1		○	
163	Fluid circuit and flow demonstration apparatus	1. Water pump and drive motor Type : Hydraulic volute Head x Flow rate 15m x 0.8l m ³ /min 2. Water pump and drive motor Type : Hydraulic 3. Francis water turbine Head x Flow rate 12 x 1l /sec Rational shaft speed 1000rpm (max.) Accessories 4. Hydraulic speed control governor 1) Hydraulic oil gear pump & motor 2) speed governor 5. Pelton water wheel Head x Flow rate 16.5m x 3.5 l/s. Rational shaft speed 800rpm (max.) 6. Channel 1) Open channel 2) Flow baffle plate 3) Flow rate measurement etc. 7. Water pump tank 1) Water reservoir device 2) Accessories 8. Flow pressure set device 1) Pressure set (0-4 Kg/cm ² G changeable) 2) Overflow reservoir tank etc. 9. Flow rate measuring device 1) venturi flow meter 20m 2) Orifice 17.8m 10. friction loss measurement device 1) Straight pipe 2) Pipe circuit element etc. 11. Balance and weigh tank 12. Electric instruments and meter pannel 13. Standard accessories	1		○	
164	Double head grinder	grinder wheel φ 255 Motor power : (130w + 400w) x 14 220v, 60Hz with dust collector (400w)	1		○	

No.	Name	Description	24	21	22	23
25 464 165	Process Feedback Control Study Unit	1. Desired value set station -Scale length : 100mm -Program cycle : 24hr type 2. Recorder & controller 1) Electronic recorder -Mounting : Panel mounting -Input signal : 1 to 5V D.C 2) Electronic controller -Cascade setting signal : 1 to 5V D.C 3. Manipulator 1) 2-way selector -Selecting system : Manual -Input signal : 4 to 20mA D.C -Output signal : Ditto 2) Control for temperature -Electric heater (3KW) 4. Controlled system -Metering water tank : $\phi 105 \times 1150L$ 5. Primary means (Detector) -Temp. detector : Thermal resistor 100 Ω x 3wires -Flow rate detector : Range 500l/hr -Level detector : Level selector 6. Transmitter & converter -Flow rate, level transmitter -Pressure transmitter -Temperature transmitter 7. Water feed device 8. Measuring pick up 9. Compressor	1			0
26 166	Air flow Demonstration Apparatus	1. Fan : centrifugal turbo flow rate(max) 30ml/min Delivery pressure(max) 130mmHg Rotational speed 2900-1200rpm 2. Drive motor & variable speed device 2.2Kw 3. Air duct 240mm 4. Air Flow rate control device throttle-valve-setting 5. Air Flow rate measuring detectors 6. Air velocity 7. Friction loss measuring tape in air duct 8. Instrument etc.	1			0

10. Mechatronics application laboratory

No	Name	Descriptions	Q'ty	'86	'87	'88
①	One Board Micro-Processor Training Port	Temperature Operating : 5-40°C Relative Humidity : 20-80 %	10	○		
2	Circuit Tester (Analogue Multimeter)	Analogue type Power Source: Dry battery	40	○		
3	Oscilloscope	40 MHz., 2-Channel	20	○		
4	Pulse Generator	DC-50 MHz. (20Hz. - 50MHz.)	20	○		
5	Digital Multimeter	DCV, ACV, Ohm 4½ (Display)	5	○		
6	Function Generator	0.1 Hz. - 10 MHz.	20	○		
②	DC Power Supply (Voltage Regulator)	Output : 0 - +35V, 3A 0 - -35V	30	○		
8	DC. Power Supply (Voltage Regulator)	Output Ranges; 0 - 10 A (at 0-2V) 0 - 5 A (at 0-16V) 0 - 2.5 A (at 0-35V) 0 - 1 A (at 0-80V)	10	○		
9	Logic Analyzer	For 8 bit With Circuit emulator (For Z-80A and 8085)	2	○		
10	Generally use Instruments	Am-meter, Volt-meter, Sliding rheostat & Etc.	64		○	
11	Microprocessor Development System	For 8bit (Z-80A) With Software and Etc	4		○	

No	Name	Descriptions	Q'ty	'86	'87	'88
12	LCR Meter	C: 0.01pF-19.99mF L: 0.01uH-19.99kH R: 1m Ohm-19.99Mohm	4		○	
13	X-Y Recorder	A3 Size 2 Pen Recording 50uV/cm to 20V/cm	2		○	
14	X-Y Plotter	A3 Size(400x285mm) Interface:RS-232-C 8PENS	2		○	
15	DC Voltage/Current Standard	Output:10mV-10V With Semocinductor Probe and GP-IB Interface	1		○	
16	Wow Flutter Meter	Range: 0.003-3% (5 Ranges)	1		○	
17	Sequential Control System Trainer	Fundamental Experimental Circuits. 1. Delay Circuit 2. Self Holding Circuit 3. One Shot Pulse Generator Circuit 4. Flicker Circuit 5. Etc.	10		○	
18	Logic Circuit System Trainer	Logical Function Panel Display Panel Power Supply Panel (DC 5V) Digital Counter Panel	10		○	
19	O-P Amplifier System Trainer (O-P Amp Circuit System Trainer)	The System Consists of the Following Equipments Basic Operation Circuit Application Circuit Power Source With +15V Accessories and Space Components	10		○	

No	Name	Descriptions	Q'ty	'86	'87	'88
20	Electronic Circuit Trainer (Electronic Control Trainer)	For Education of Electronic Control	10	○		
②1	Digital Thermometer	-60°C to +500°C With 1°C Resolution	3		○	
22	Pocket Tachmeter	60 to 19999 rpm. 1 to 19999 rpm	4 (2)		○	
23	Portable Luxmeter	Lux: 0 to 3/10/30/100/300 Lux: 0 to 300 Lux	4 (2)		○	
24	Insulation Tester	500V/1,000 Mohm	1		○	
25	Programmable Controller	PC: C-20 相当品	10		○	
26	Air Cylinder Training Load Equipment	Small Type Air Cylinder	2	/		
27	Motor Limit Control Equipment	Control Points: 12 Output Points: 8	2		○	
28	Robot	Movemaster	4		○	
29	Educational Robot System	Movemaster Pesocom Software	1	/		
30	ROM Writer	16 Kbit - 512 Kbit	10	/		
31	ROM Eraser	Ten pieces P-ROM Erase at the same Time	1		○	

No	Name	Descriptions	Q'ty	'86	'87	'88
32	Debug-RAW	8 bit	10			
33	Automatic Warehouse Control Model	4x3 Shelves Model One-Board With Software	1		○	
34	Mech-Tronics Experimental Equipment	DC Motor/Brush Less Motor Stepping Motor	3		○	
35	IC Sequential Trainer	For Education of IC Sequence	10	○		
36	CR Oscillator	1-Hz. - 99.9-KHz.	8			
37	Transistor Circuit Experimental Equipment	The System is the Purpose to Study the Operation of Transistor Amplifier, Oscillation, Detection and Pulse Generation.	40/ 1			○
38	Intelligent Mobile Robot System	Multi-articulated 6 axes Automatic position determination Pattern recognition Collision avoidance by supersonic Area sensor : CCD Camera	1		○	
39	Personal Computer System 1) Main body	CPU : 80286 Coprocessor : 80287 Main memory : more than 512KB FDD : 1MB HDD : 20MB Expansion slot : 8 ea RS-232C : 2 ea GP-IB interface 14inch Color	6 (6)		○	
	2) Monitor	14inch Color	(6)		○	
	3) Printer	24 x 24 dots 132 columns	(3)		○	
	4) Software	MS-DOS, MS-Fortran, etc.			○	

No.	Name	Description	Qty	'86	'87	'88
40	68000-based one-board Microcomputer	<ul style="list-style-type: none"> CPU/memory board 68000 CPU board RAM 128KB ROM 64KB Interrupt 7 levels RS-232C Extender Universal board 7-slot card cage 	10		○	
41	Transistor Checker	<ul style="list-style-type: none"> h_{FE} measurement range: 10-1000 (3 ranges) I_{CB} measurement range: 0.002 μA-10mA (6 ranges) 	1		○	
42	Digital Memoryscope	<ul style="list-style-type: none"> 12 bit x 4096 words 2 μs/word 2 input channels frequency: DC-100KHz output: DATA, PEN with GP-IB interface 	1		○	
43	Servo Motor Position Control Trainer	Servo Motor, Control Unit, etc.	10			要検
44	Servo Motor Velocity Control Trainer	Servo Motor, Generator, etc.	10			要検
45	Digital Dynamometer 次項の NO.50	Digital Electronic Measuring Eddy Current Brake Dynamometer, Digital Counter	1			要検
46	Computer Control Experimenting Apparatuses 次項の NO.51	<ul style="list-style-type: none"> 8-bit Parallel I/O Contact input A/D Converting Amplifier D/A " " Inverter Controller Inverter I/O Signal Display Counter (Serial Parallel Conversion) 3-phase Induction Motor 	1			要検

10. MECHATRONICS APPLICATION LABORATORY

No.	Name	Description	Q'ty	'86	'87	'88
47 41	Mechatronics Training Kit	1) I/O Interface 2) Position Sensor by ball-screw 3) Position Sensor by wire 4) Stopping Motor Kit 5) DC Servo-motor Kit 6) Servo Feedback Kit 7) Actuator (Pneumatic), Chip handler 8) Actuator (Pneumatic), Melody finger 9) Air source for Pneumatic Machine 10) Mechanical control, Robot arm 11) 3-axis Robot Kit 12) Automatic transmission model 13) Sequencer 14) ATM Logic model 15) Hardware manuals, Cables, Training Books of each kit	2 (10) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2)			○
48 42	Magnetic Circuit training Apparatus	<ul style="list-style-type: none"> • Magnetic coil : 250, 500, 750, 1000 turns with terminal each • Power house for magnetizing Manual : DC 0 - ± 4 A Auto : AC 0 - ± 4 A 5 Hz • Probe : Hall element type, Vertical and Horizontal type each 1 pce. • Gauss Meter , Measuring range: ± 0.02, ± 0.1, ± 0.5 Wb/m • Iron core : iron, ferrite and alnico each 1 pce. 	1			○
49 43	Electromagnetics Induction Experiment Apparatus	<ul style="list-style-type: none"> • Suction power measurement of electromagnetics • Electromagnetics : 0.8 φ 180 turns solenoid with iron core • Balance : capacity 0 - 500 g • Stand : 0 - 4 N with graduated in newton • Power source : stabilizer output 0 - 4 A • Electromagnetics measurement : solenoid 1.2 φ 500 turns with balance plate 	1			○
50 44	Digital Dynamometer	Digital electronic measuring type <ul style="list-style-type: none"> • Eddy current brake dynamometer <ul style="list-style-type: none"> - Capacity : 2kw - Exciting current : about 3.2A - sensor : Load cell & Rotary encoder • field regulator • Digital indicator <ul style="list-style-type: none"> - measuring item : Torque , revolution 	1			○
51 45	Computer Control Experiment Apparatuses	<ul style="list-style-type: none"> • 8bit parallel I/O • Contact input • A/D converting Amplifier • D/A • Inverter Controller • Inverter • I/O signal Display • Counter (Serial Parallel Conversion) 	1			○

No.	Name	Description	Q'ty	'86	'87	'88
46/ 52	Transistor Circuit Experimental Equipment	<p>TRAINING CONTENTS</p> <ul style="list-style-type: none"> • Measurement of Static Characteristics of Semiconductor • Calculation of fixed values on transistor equivalency circuit (h-parameter) • Characteristics of RF Amp. • IF Amplifier Circuit • Performance of Detector Circuit • AF Amplifier Circuit • Frequency Converter • AF Power Amplification Circuit • Pulse-Generator Circuit • Cut-off and saturation characteristics of transistor • Multi-vibration Circuit • Stabilized Circuit of power Supply 	1			○
53 47	CNC Training Lathe	<ul style="list-style-type: none"> • Swing over bed : 200mm • Distance between center : 400mm • Spindle bore: ϕ 20mm • Spindle taper : MT-3 • Spindle speed : 25-2000 rpm • Motor : DC servo 450 W • Power : 1ϕ, 200V 2.2 KVA • CNC Control system • Control system : open loop • Simultaneously controllable axis : Two axes • Programming : Absolute, incremental • Incremental system: X axis 0.01mm • " " " Z axis 0.005mm • Input of part program: Input by MDI Keyboard • Memory capacity: 12,000 characters • Special acc. <ul style="list-style-type: none"> 1) Automatic turret tool post 2) Simulation plotter 3) Optical tool setting gauge 4) Work stopper 5) Collect chuck 6) Rolling center 7) Spindle center 8) Tool holder (ϕ 4, ϕ 6, ϕ 8, ϕ 10) (ϕ 12, ϕ 14, ϕ 16) 9) Trainer 10) Tool bit set 	1			○
54 48	CNC training Milling Machine	<ul style="list-style-type: none"> • Table dimension : 600x200mm • Axis travel : X axis 300mm : Y axis 200mm : Z axis 350mm • Spindle nose: JIS NT No. 40 • Spindle speed : 30-3500rpm • " motor : DC servo 1.1KW • Power : 3 ϕ, 220V, 3.5 KVA • CNC Control system • Control system : Open loop • Simultaneously controllable axis : 3 axis • Increment system : X, Y, Z : 0.001mm • Memory capacity for part program : 24,575 character 	1			○

No.	Name	Description	Q'ty	'86	'87	'88
55 4-9	FFT signal Analyzer	<ul style="list-style-type: none"> special acc. 1) Machine vice (manual) 2) Automatic index table 3) " tool changer (8 pieces) 4) 4" chuck (manual) 5) Tail stock (manual) 6) Tool set • Processing Mode <ul style="list-style-type: none"> - Auto mode, Manual Mode, Program mode, Basic Mode • Analytic Function <ul style="list-style-type: none"> - cross power spectrum, Auto power spectrum, Transfer function, Linear spectrum (FFT), Coherence function, 1/3 Octave Analysis, etc. • 0.2Hz-100KHz, 72dB/oct dynamic range • A/D Converter resolution: 12bit • input : 2 channel • ±0.1 V to ±200V/Full scale • Memory capacity : 16bit x 64K word • mini-floppy (256K byte double side, double density) • GP-IB Standard • Basic program with Key board • Option scope wagon 	1			○
56 4-0	Microcomputer Training Kit	<ul style="list-style-type: none"> o cpu = 8085A o clock = 2.45MHz o ROM = 2Kbyte = Max 8K byte o RAM = 1K byte = Max 3K byte o Display = 8 Column 7 Segment LED o Parallel I/o Port <u>Accessory</u> 100 pin connector 	15			○
57 4-1	Digitizer	<ul style="list-style-type: none"> o Resolution = 0.001" o Accuracy = 0.02" o Rate = 150 Pairs/sec o Active surface area = 11" x 11" or 11.7" x 11.7" o Electronics and Universal Powersupply housed inside the tablet o 4- Button Cursors o Connection Cable 	3			○

* Without getting a digitizer in Japan ,
the item may be cancelled.

No.	Name	Description	Q'ty	86	87	88
4-2 58	Paper tape puncher /reader, printer	<ul style="list-style-type: none"> o tape reader 8 channel paper tape reading speed : 250 char./sec. o tape puncher 8 channel paper tape punching speed : 50 char./sec o printer char./Line : 40 printing speed : 1.2 lines/sec o RS-232 C Interface Accessory RS-232 C Connection Cable Manual 	1			0

MECHATRONICS LABORATORY (2次年度)

No	Name	Description	Q'ty	86	87	88
1	Accessories of Movemaster	<ul style="list-style-type: none"> o Standard hand o Teaching Box o Software (for position determination) FSR-100 o Software (for position determination) FSR-200 o Technical Manual 	3set (3) (3) (1) (1)		○	
1	Educational ROBOT System	<ul style="list-style-type: none"> o 5-Axis ROBOT o Cylindrical coordinates ROBOT o Conveyer module (150 x 1200, contained sensor) o Work model o Measuring device of Weight o Standard Accessories o Training book and Manual (S/W, H/W) o Training contents <ul style="list-style-type: none"> - Position control of ROBOT - Multi-control between ROBOT and other device - ROBOT system control with computer - sensor interfacing 	1set (1) (1) (2) (2) (1)		○	

11. Computer training room

No.	Name	Descriptions	Q'ty	'86	'87	'88
①	Personal	16 bit	20 Set			
②	Printer	24x24 dot	10 Set			
③	Cables and Others	Accessories for the above Item 1 to 2	10 Set		○	
④	C.R.T	Collor	20 Set		地	
⑤	Software	MS-DOS MS-Fortran etc			購	
6	Personal Computer	16 bit	20 Set		入	
7	Printer	24x24 dot	10 Set			
8	C.R.T	Collor	20 Set			
9	Cables and Others	Accessories for the above Item 6 to 7	10 Set			
10	Software	MS-DOS MS-Fortran etc				

12. Heat treatment laboratory

No.	Name	Descriptions	Q'ty	'86	'87	'88
1	Mounting Press	Diameter: 25, 30 or 40mm Pump capacity: 4,000kgs. Electric heater: 1KW	1	○		
(2)	Oil Quenching Tank	Tank size: 450W x 450L x 700H mm Pipe heater: 3-phase 2KW	1	○		
3	Polishing Machine	Single disc polisher Polishing disc of 200mmØ Disc speed : 300 - 600rpm	2	○		
(4)	Subzero Treatment Equipment	Top lid opening type Temperature range: Room temp. to - 180°C Effective dimension: 400W 400L x 500H mm	1-	○		
(5)	Metallurgical Microscope	Total magnification: 35X, 2,000X Electric power source: Single phase 110V 50/60Hz.	2	○		
6	Jominey Tester	Temp : 1350°C Material : Ceramics	1	○		
7	Hot Air Dryer	Blowing dryer for drying of the Specimen Electric source : Single 100V 200W	1	○		
8	Muffle Furnace (For Annealing)	Effective size : 200W x 400L x 200H mm Temperature : 600 - 1,000°C	1	○		
9	Carburizing Furnace	Pit type Drip system Effective size: 2300 x 350mmH	1		○	
10	Tempering Furnace	Operating temperature: 150 - 600°C	1		○	
(11)	Salt Bath Furnace	Pot type Temperature: 1,050 - 1,300°C	1		○	
12	Vacuum Furnace	Automatic gas and oil quenching type	1		○	
13	High Frequency Induction Furnace	Output: 10 - 20 KVA	1			○

No.	Name	Description	Q'ty	'86	'87	'88
14	Atmosphere Furnace	Max. temperature: 1,300°C Effective dimension: 300W x 400L x 200H mm	1			
14 14	Electric Salt Bath	The Electric salt bath for the Multi-Quenching pot dimension: 400W x 600L x 400H mm	1			○
15 15	Repot electric furnace	Max. Temp : 1350°C Operating temp : 1300°C Power requirement : 4KW Outside dimension: 626 φ x 670mm Inside dimension: 400 φ x 400mm Process capacity : 30-40Kg	1		○	
16 16	Optical pyrometer	.Temp range: 0 to 1400°C .Calculate temperature minimum, maximum, difference .Displays single readings .Eliminates most atmospheric interference .Calibrates automatically .Uses advanced optics .interference .Calibrates automatically .Uses advanced optics	1		○	
17 17	Digital thermometer	.5 thermocouple types conforming to JIS standards .Type of display : LED display .Unit marks : mv, °C and K	1		○	
18 18	High speed wheel cutter	.Radius of cutting wheel : 360 φ .Cooling : scible oil .Should be equipped with safty cover .Size : 700x500x1500Hmm .Portable type	1		○	
19	Fluidized Heat-treatment Furnace	1) dimension : inner dia. 200φ height : 300mm 2) Max. temp : 1050°C 3) temp. accuracy: ±5°C 4) power : 8KW				○
20	Quenchio-meter	5) others Power: 100V, 50/60Hz, 1.2KW Temperature: 25-900°C X-Y type Automatic Tem. Control & Recorder				○
21	Scanning Electron Microscope (SEM)	1) voltage : 2-30KV (7 steps) 2) Magnification : 31-200,000X 3) Analyzing capacity : 6mm 4) Tiltting angle : 0-85 5) specimen stage				○

13. Surface treatment laboratory

No	Name	Descriptions	Q'ty	'86	'87	'88
1	Hull Cell Test Kit (Hull Cell Tester)	The set contents:- Rectifier, Hullcell 267ml, Heater, Thermostat & Others	2	○		
2	Electrolytic Thickness Tester	Measuring range: 0.05µm to 100µm Accuracy : within ± 5%	1	○		
3	Salt Spray Test Instrument (Salt Spray Corrosion)	Inner size of test chamber : 600 x 500 x 900mm	1	○		
4	Multi Meter	DCV, ACV, DCA and ACA	1	○		
5	Electro-Magnetic Inductive Thickness Tester	Measuring range: 3range 0 - 1,000µm or more	1	○		
6	Temperature and Humidity Test Chamber	Temperature range: -40°C to 80°	1	○		
7	Gloss Meter	Measuring angle range: 20 to 85°C Aperture : 45mmØ Complete with standard acc.	1	○		
8	Multi Spectro Colour Meter (Digital Color Difference Meter)	Wave length range: 400 700mm Complete with standard accessories.	1	○		
9	Stereo Zoom Microscope	Total magnification: 3.3x50 160x Complete with standard accessories.	1	○		
10	Spiral Contract Meter (Spiral stress tester)	consist of;- 1.Contractmeter x1 2.Contractmeter stand x1	1	○		
11	Eddy Current type of Thickness tester	Measuring principle: Eddy current Measuring range: 0 to 500µm	1	○		
12	Cass Test Instrument (Cass Tester Copper accelerated)	Inner size of Test chamber : 90 x 50 x 60cm No of test pucs: 15' .48 pcs. 30' 30 pcs.	1	○		

No	Name	Descriptions	Q'ty	'86	'87	'88
13	Anotest (Sealing tester for anodic films)	Measuring range: 3 - 200 μ s (admittance) 0 - 2 (dissipation) Accuracy: 3%	1	○		
14	poroprint (porosity detector)	Electro graphic pin hole tester Current: 0 - 300mA Voltage: 10V	1	○		
15	Adhesion Tester	The radius of circle of the needle revolves: 0 - 5mm (should be adjustable)	1	○		
16	Ultrasonic cleaner	110V/220V, 28KHZ 30%	1	○		
(17)	Trichloroethylene Degreaser	Size: 1,050 x 350 x 900Hmm	1		○	
(18)	Alkaline Degreasing Tank	Size: 300 x 350 x 400mmd	2		○	
19	Electro Cleaning Tank	Size: 300 x 350 x 400mmd	1		○	
20	Acid Dipping Tank	Size: 300 x 350 x 400mmd	3		○	
21	Neutralization Tank	Size: 300 x 350 x 400mmd	1		○	
22	Copper Strike Plating Tank	Size: 300 x 350 x 400mmd	1		○	
23	Copper Plating Tank (CuSO4)	Size: 300 x 350 x 400mmd	1		○	
24	Copper Plating Tank	Size: 300 x 350 x 400mmd	1		○	
25	Nickel Plating Tank	Size: 300 x 350 x 400mmd	1		○	
26	Chromium Plating Tank	Size: 300 x 350 x 400mmd	1		○	
27	Hard Chromium Plating Tank	Size: 300 x 350 x 400mmd	1		○	
28	Zinc Plating Tank	Size: 300 x 350 x 400mmd	1		○	
29	Nitric Acid Dipping Tank	Size: 300 x 350 x 400mmd	2		○	
30	Chromate Coating Tank	Size: 300 x 350 x 400mmd	3		○	
31	Etching Tank	Size: 300 x 350 x 400mmd	1		○	

No.	Name	Descriptions	Q'ty	'86	'87	'88
32	Anodizing Tank	Size: 300 x 350 x 400mmd	1		○	
33	Dyeing Tank	Size: 300 x 350 x 400mmd	2		○	
34	Sealing Tank	Size: 300 x 350 x 400md	1		○	
35	Water Rinsing Tank	Size: 300 x 350 x 400mmd	9		○	
36	2-Range Water Rinsing Tank	Size: (300 x 2) x 350 x 400mmd	7		○	
37	Drug Out & 2-Range Water Rinsing Tank	Size: (300 x 3) x 350 x 400mmd	7		○	
38	Silicon Rectifier	Input: 3-phase 220V Output: DC 12V 100A	1		○	
39	" "	- Ditto --, but Output: DC 10V 100A	5		○	
40	" "	- Ditto --, but Output: DC 12V 200A	1		○	
41	" "	- Ditto --, but Output: DC 12V 200A	1		○	
42	" "	- Ditto --, but Output: DC 25V 100A	1		○	
43	Pre-Treatment Line Control Panel	For Rectifier controller X1	1		○	
44	Electro plating Line Control Panel	Cu, Ni, Electro Plating For Rectifier Controller X4	1		○	
45	" "	- Ditto --, but For Rectifier controller X3	1		○	
46	Anodizing Electro Plating Line Control panel	For Rectifier controller X1	1		○	
47	Filter	Type: Z-1NS	7		○	
48	Blower	Type: TB: TB-750	1		○	
49	Buffing Machine	Type: EFC-3.7	1		○	
50	Centrifugal Dryer	Type: HB-30	1		○	
51	Dryer	Type: NA-201	1		○	
52	Cooling Device System	For Cu, HCu, Anodize and Solution	1		○	

No	Name	Descriptions	Q'ty	'86	'87	'88
53	Fume Hood	For each plating tank	1		○	
54	Barrel H/C	Type: K-10	2		○	
55	Analytical Balance	Min. Reading: 0.1mg	1		○	
56	Digital PH Meter	PH 0 - 14	8		○	
57	Chemical Analyzer Set	The set includes colorimeter.	1		○	
58	Water Distilling Apparatus	Capacity: 6 liters/h.	1		○	
59	Culture Bath Shaker (Analytical Agitator)	Interior: 500W x 300L x 160Hmm	1		○	
60	Specific Gravity Hydrometer	Hydrometer Set	4		○	
61	EC Voltage/Current Standard	High accuracy: +0.08%	1		○	
62	Direct Reading Balance	Min. Reading: 0.05mg.	1		○	
63	Thermostat Oven (Dry Oven)	Temperature range: 0 to 200°C	1		○	
64	Vacuum Pump	Free air displacement: 35 liters/min.	1		○	
65	Sulphameter	Sulphur meter consist of;- 1. Centrifuge equipment 2. Graduated centrifuge tubes 3. etc.	1		○	
✓ 66	Atomic Absorption Spectrometer	Atomic absorption & Flame emission spectrophotometer	1		○	
▷ 67	Weather Meter (Weather - 0 - Meter)	Water cooled Xenon Long-life lamp 5.0 KW x 1 Carbon arc lamp 135V 16A x 2 pcs.	1		○	
68	Thermostat oven(Dry Oven)	.Temp. range: 0 to 200 C .Interior material :SUS 304 .Interior size: 400Wx400Lx600Hmm .Heater: 1.5KW	1		○	
69	Mini plating plant system	.Plating tank x 5 size: 260Wx170Lx280Hmm .Rinsing tank x 1 size: 260Wx170Lx280Hmm .Silicon rectifier x 2 capacity: 20Vx10A .Heater: SUS 304 x 5 capacity: 0.5KW .Intank model filter x 2 .Mini electro plating barrel x 1 size: 150Lx110Wx250Hmm	1		○	

No.	Name	Description	Q' ty	'86	'87	'88
1 70	Wear resistance tester	1) Reciprocation : 40-60 cycle/min. 2) Friction Area : 30x12 mm 3) Load : 100 - 700g 4) Capacity : AC 100V, 70VA, 50/60Hz 5) Specimen size : min. 30x50mm max. 70x300mm	1		○	
2 71	Analytical Balance	1) Maximum Capacity : 200g 2) Minimum Reading : 0.1mg 3) Standard Deviation : 0.1mg 4) Linearity : ±0.2mg	1			○
3 72	Metallurgical Microscope	1) Total Magnification : 35x-2,900x 2) Focusing Mechanism: 1. coarse adjustment 2. fine adjustment 3) Electric power source: single phase 110V 50/60Hz <u>Optional accessories</u> 1. polaroid camera - 1	1			○
4 23	Micro-vickers Hardness Tester	1) Test Load : 10, 25, 50, 100, 200, 300, 500, 1000 2) Accuracy : Better than ±1% <u>Accessories</u> 1. standard vice - 1 2. setting table (slender) - 1 3. slope table - 1 4. setting table (thin) - 1 5. microscope for measuring - 1 6. hardness tester piece - 1 7. power cord - 1 8. pilot lamp - 1 9. hardness calculator table - 1 10. diamond penetrator - 1 11. knoop penetrator - 1	1			○

14. physics laboratory

No	Name	Descriptions	Q'ty	'86	'87	'88
1	Dewar vessel calorimeter with base and lid	height : Approx. 90mm dia. : Approx. 70mm	3	0		
2	Deflection elastic coefficient measuring instrument		2	0		
3	Wave motion explanation device		2	0		
4	Mach wave motion explanation device		2	0		
5	Precision optical bench set		2	0		
6	Westphal Specific gravity balance		2	0		
7	Mechanical energy experiment device		2	0		
8	Young's modulus measuring equipment		2	0		
9	Experimental device of angular momentum		2	0		
10	Linear expansion measuring equipment		2	0		