V- Annual Work Plan (1991 - 1992)

Talbe(3) gives the main planned events beginning from the last Japanese fiscal year. It is worth saying that all plans were executed on time.

Other noneplanned events or works were completed, e.g. : Purchase of two computer systems (Tulip), Purchase of spare parts and some books (by the Japenese experts budget).

VI- NSCL`s technical documents

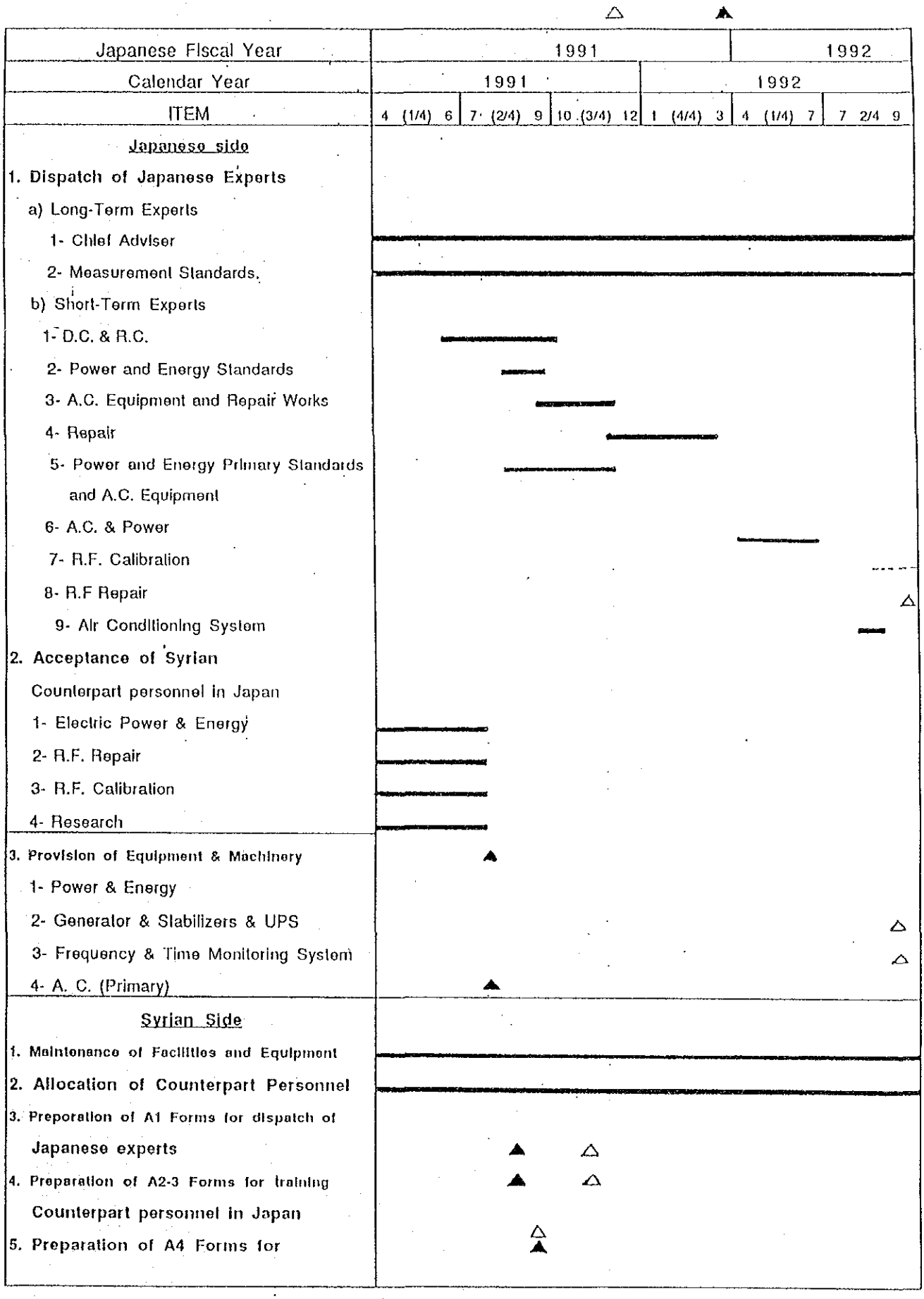
Table(4) shows the number of technical documents (procedures, result sheets etc..) prepared or under preparation by NSCL`s sections.

Indeed calibration works are carried according to specified procedures. The measured values are filled in certain processing sheets which facilitate the calculation of the final results. Those results are kept in specific result sheets. Certificates, when requested by our customers, contain also the appropriate result sheet.

Historical cards are used to study the behaviour of our National Standards, transfer standards, reference standards and related instruments.

The transfer card is attached to any instrument to be calibrated or repaired in order to obtain necessary information related to time or location. It is indispensable to calculate the charge we are planning to request from our customer.

Talbe(3): ANNUAL WORK PLAN FROM APRIL 90 TO JULY 91 ---- Planned ___ Accomplished



NUMBER OF TECHNICAL DOCUMENTS PREPARED OR UNDER PREPARATION AS OF 22-07-1992

DOCUMENTS UNDER PREPARATION													
LAB		AC		DC		TEM		RF		REP		OSC	
CAL/ADJ		a	b	a	b	a	b	a	b	a	b	a	b
PROCEDURE	P	2	0	1	0	0	0	0	0	0	0	0	0
	S	4	0	2	2	0	0	11	0	0	0	0	0
	T	5	0	0	0	0	0	10	0	0	0	0	0
FORMAT	P	0	0	0	0	0	0	0	0	0	0	0	0
OF RESULT	S	0	0	3	1	0	0	0	0	0	0	0	0
SHEET	T	0	0	0	0	0	0	0	0	0	0	0	0

a- Number of technical documents for the instruments belonging to each mentioned lab in NSCL .
b- Number of technical documents for the Instruments concerning the other labs In NSCL .
c- Number of technical documents for the instruments belonging to the other company.

P: Primary std S: Secondary std T: Tertiary std and Measuring Inst

Table(4): Technical Documents

DOCUMENTS ALREADY PREPARED																				
LAB		AC & POWER			DC & RC			TEMP			RF			REP			OSC		
CAL/ADJ		a	b	C	a	b	C	a	b	C	a	b	C	a	b	C	a	b	C
PROCEDURE	P	2	0	0	2	0	0	2	0	0	1	0	0	0	0	0	0	0	0
	S	3	0	0	18	5	0	2	1	0	2	0	0	0	0	0	0	0	0
	T	5	1	3	0	0	0	5	0	2	0	0	0	7	0	11	2	0	0
RESULT	P	4	0	0	6	3	4	5	0	0	1	0	1	0	0	0	0	0	0
SHEET	S	7	6	0	34	18	105	2	1	0	17	0	0	0	0	0	0	0	0
	T	10	0	102	4	8	45	6	6	10	11	2	69	13	0	10	1	0	0

a- Number of technical documents for the Instruments belonging to each mentioned lab in NSCL .
b- Number of technical documents for the instruments concerning the other labs in NSCL .
c- Number of technical documents for the instruments belonging to the other company.

P: Primary std S: Secondary std T: Tertiary std and Measuring Inst

Continued Table(4): Technical Documents

VII- NSCL's activities

NSCL axes of works are determined by our goals. To fulfill those goals we have to give special attention to: marketing and advertising, leveling up, routine repair & calibration in addition to our major activity: "the preservation and development of our National Standards".

The following sub- paragraphs describe our main activities:

VII-1- National Standards Preservation:

National Standards Preservation is one of the most important tasks we have to accomplish. Actually, every section is conducting periodical measurements, in order to study the stability, change and behaviour of those standards. Historical cards are filled to centralize all information related to such standards.

The pursuit of the annual work plan assures reliability and traceability of our measurements regarding our "National Standards".

For the time being our National Standards are technically considered in satisfactory condition.

VII-2- Practice of trouble - shooting adjustment and calibration:

The number of monthly repaired instruments is shown in figure(2). The total number, as of 30-06-1992, is 1946 :

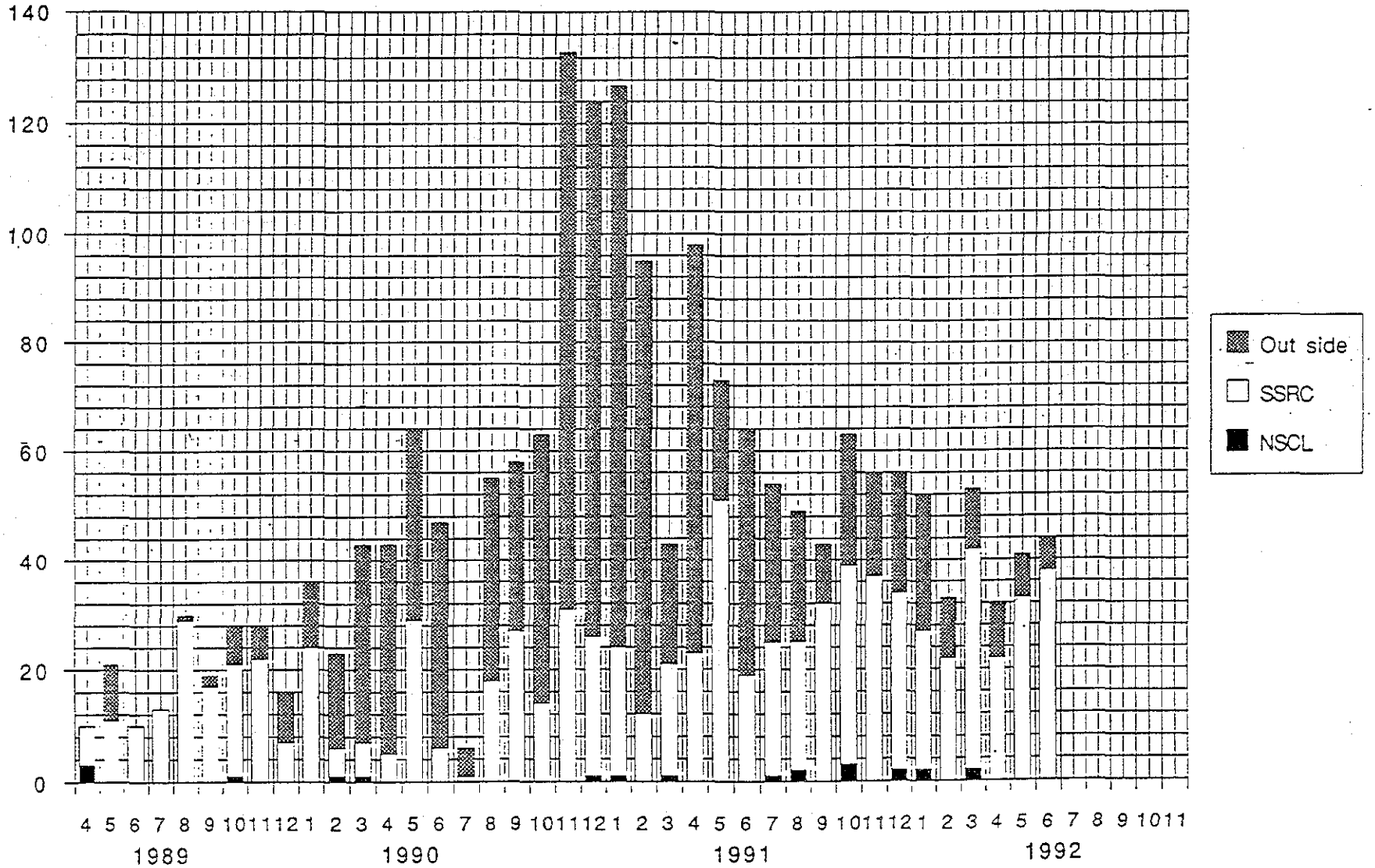
21 Belonging to NSCL
839 Belonging to SSRC
1086 Belonging to outside organizations

Last year, by 30-06-1991, the total number of repaired instruments was 1369:

10 Belonging to NSCL
451 Belonging to SSRC
908 Belonging to external organizations

We failed repairing about 20% of submitted instruments due to our shortage in:

Spare parts
Service manuals
Extension boards



Fig(2): Monthly repaired instruments

The number of monthly calibrated instruments is shown in the figure(3). The total number as of 30-06-1992 is 6579:

2910 Belonging to NSCL
1155 Belonging to SSRC
2514 Belonging to external organizations

Last year, as of 30-01-1990, the total number of calibrated instruments was 4220:

1336 Belonging to NSCL
919 Belonging to SSRC
1965 Belonging to external organizations

It is worth mentioning that 60% of calibrated instruments (excluding NSCL's) were adjusted. Attachment(2) gives the list of our customers.

Based on an internal ,tariff index we have calculated the virtual monthly income table(5), table(6).

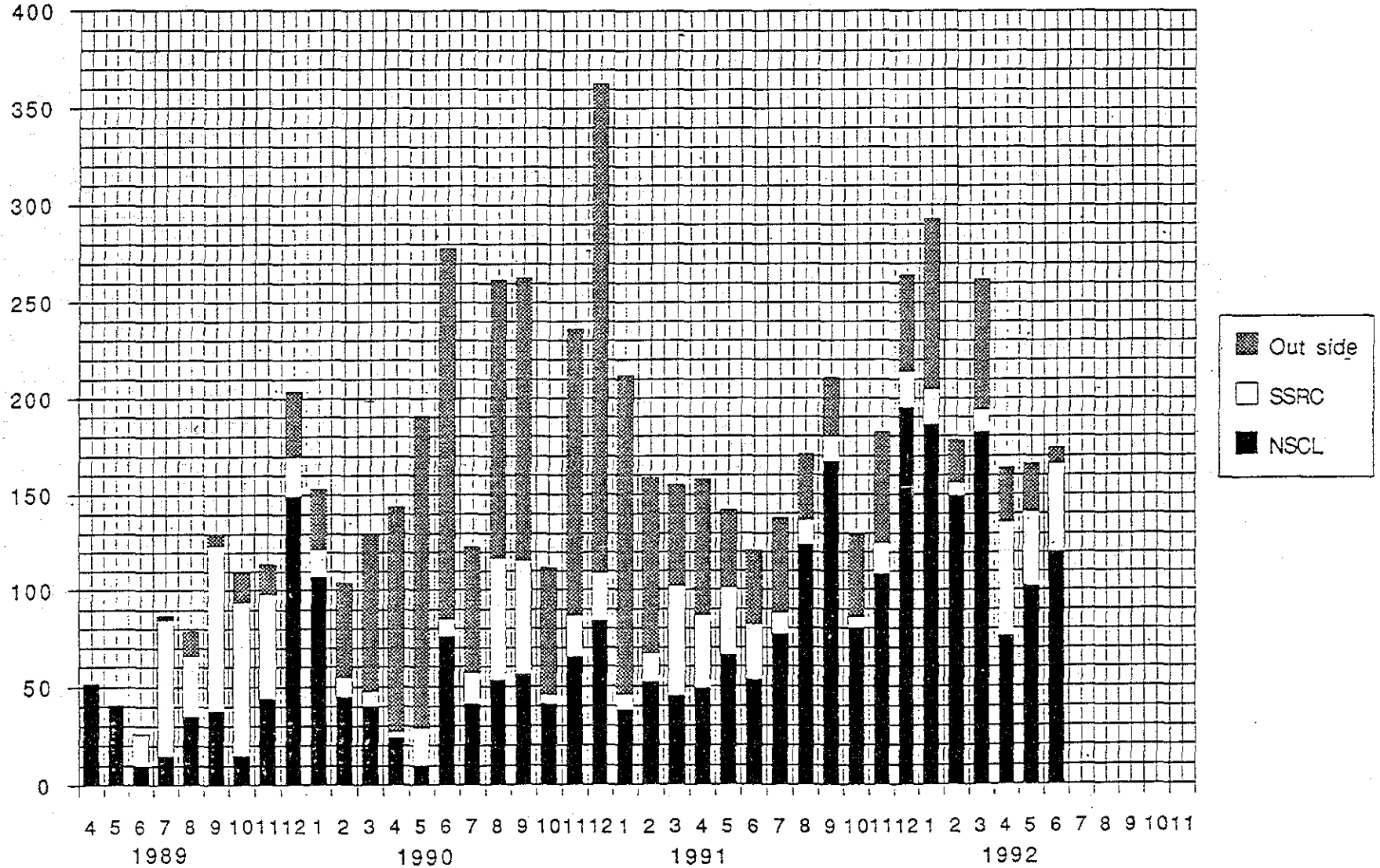
VII-3- Systems Evaluation :

NSCL received some evaluation standards which were previously calibrated by Japanese Laboratories (JEMIC, JMI). Those standards were calibrated at NSCL and sent back to Japan.

We are waiting to receive them and to compare the results obtained at with those obtained NSCL in Japan. The following figures present examples of the uncertainty claimed by NSCL.

Description	Uncertainty
1.018xxx V	2ppm
1 Ω	5ppm
(1,25,10)MHz	10^{-10}
RTD (pt-25)	0.05 °C
1000 pF	0.01 %
10V; 1kHz	0.05 %

examples of the uncertainty of measurement systems claimed by NSCL



Fig(3): Monthly calibrated instruments

Table(5): Virtual Income during 1991

Month	Repair	Calibration			Total		Final Total	
		External		Internal	Advertising	Real Cost	1+2+4	1+3+4
	1	Advertising	Real Cost	Real Cost	1+2	1+3		
		2	3	4				
Junuary	210200	36825	77475	165665	247025	287675	412690	453340
February	205765	29850	56950	157965	235615	262715	393580	420680
March	54240	45975	111785	127510	100215	166025	227725	293535
April	347100	50925	90095	110765	398025	437195	508790	547960
May	203050	36300	89790	108490	239350	292840	347840	401330
June	331250	19725	55555	96185	350975	386805	447160	482990
July	167620	32550	90150	141720	200170	257770	341890	399490
August	86345	25725	64885	172015	112070	151230	284085	323245
September	290490	25425	68475	169195	315915	358965	485110	528160
October	91860	47625	87115	335715	139485	178975	475200	514690
November	152384	16200	33810	427791	168584	186194	596375	613985
December	100795	33075	82135	340045	133870	182930	473915	522975
Total	2241099	400200	908220	2353061	2641299	3149319	4994360	5502380

Table(6): Virtual Income during 1992

Month	Repair	Calibration			Total		Final Total	
		External		Internal	Advertising	Real Cost	1 + 2 + 4	1 + 3 + 4
	1	Advertising	Real Cost	Real Cost	1 + 2	1 + 3		
		2	3	4				
January	126110	66375	173725	332730	192485	299835	525215	632565
February	223350	29250	148150	300530	252600	371500	553130	672030
March	239495	27750	51250	344320	267245	290745	611565	635065
April	89600	34350	96090	176395	123950	185690	300345	362085
May	331780	21825	57355	260833	353605	389135	614438	649968
June	84190	32250	100130	258970	116440	184320	375410	443290
July								
August								
September								
October								
November								
December								
Total								

VII-4- Lectures :

Talbe(7) gives information related to general lectures (many of them presented English) held at NSCL during the period (1-7-1991 to 30-6-1992). They aim to sensitize NSCL staff about techniques and methods generally used in metrology or to inform NSCL about new trends as well as international updated information.

On the other hand NSCL organized two important courses:
Basic electronics by Eng. R. Ibrahim for repair work-shop staff.

Elementary electronics by Eng. S. M Ridah for staff whose background is not electronics.

In addition every member is presenting monthly, in his section, a chosen work or subject. The total number of such presentations during the same period has grown to eighty-two.

VII-5- Guided Tours for Visitors :

One hundred and twelve visitors toured NSCL during the period (1-7-1991 to 30-6-1992) of whom ninety five were Syrian.

NSCL is planning to have an open house before the end of this year.

VII-6- Applied Research and Development Activities :

NSCL began applied research and development activities which is the only mean to sustain our technical level compared to the progress and need of public and private companies.

We aim at designing new prodacts or developing some existing designs, in order to stimulate local industry as well as to provide some calibration laboratories with adequate standards locally made, which would thus be easier to obtain in addition cheaper.

Some of those works could also be considered, in our opinion to being suitable for collaboration with metrological laboratories such as (JEMIC, ETL, PTB, LCIE, NPL).
In the following subparagraghs we are breifly presenting those works.

VII-6-1- Saturated Standard Cell :

The second generation prototypes are made using platinum leads. The mean value measured between 11-8-1991 to 30-6-1992 , of one sample, at local temprature (23 ± 1)°C is :

$$1.018913\ V \pm 26\ \mu V$$

Talbe(7): Lectures held (1-07-1991 to 30-06-1992)

Date	Lecturer	Title	language
16-7-1991	Mr. S. Rayan	Electrical measurement and its error's	A
28-8-1991	Mr. A. Daougi	Mechanical measuring Instruments	A
4-9-1991	Mr. A. Headar	The principle of photocopy's work and how to use it	A
22-9-1991	Mr. M. K. Haj-Ebrahim	GP - IB , IEEE 488	A
25-9-1990	Mr. A. S. Karouni	The calibration method of the 732A DC reference standard "Evaluation Standard"	E
1-10-1991	Mr. M. Haferi	How data digest' are organized	A
2-10-1991	Dr. Yamanochi	What uncertainty means and how to determine the uncertainty of your system	E
2-10-1991	Mr. A. S. Karouni	Method and system used to calibrate "2794 the evalution standard"	E
7-10-1991	Mr. N. Elias	The principle of digital measuring equipment	A
9-10-1991	Mr. A. S. Karouni	The calibration method of the GR 1404A evaluation standard capacitors	E
12-10-1991	Mr. M. Harb	Evaluation standard resistance temperature detector (PT-25)	E
15-10-1991	Dr. M. Kubeitari	Calibrating very high resistance (Measurement of resistance Between 10 - 10 Ω)	A
16-10-1991	M. A. S. Karouni	The accuracy 'Improvement of the 732A calibration method on the range 10V	E
21-10-1991	Mr. S. Sadah	Electrical lighting	A
22-10-1991	Mr. A. S. Karouni & Mr. W. Saadi	The standard resistor and their measurement methods	A
4-11-1991	Mr. Z. Sweed	Arials: their kinds & methods of using	E
10-11-1991	Mr. K. Saadi	Power supplies	A
11-11-1991	Mr. N. Harba	Multimeter	A
13-11-1991	Mr. H. Bastati	A study about the structure of the computer by using the processr 8085A	A
13-11-1991	Dr. Yamanochi	30 Minutes forum uncertainy(5) various sources of uncertainty	E
16-11-1991	Mr. S. Amro	Oscilloscopes	A
20-11-1991	Dr. Yamanochi	30 Minuted forum: uncertainty(6), various sources of uncertainty	E
20-11-1991	Mr. W. Saadi	The calibration method of 1281 actual D.M.M.	A
20-11-1991	Mr. B. Makia	A/D, D/A converter	A
23-11-1991	Mr. K. Barakat	Method of calibration electronic watthour meter	A
26-11-1991	Mr. B. Abo Adas	Signal generator calibration	A
27-11-1991	Mr. E. Kanaan	A. V. R. ups	A
25-11-1991	Mr. M. Jomaa	AC Voltage/current standard 2558	A
4-12-1991	Mr. M. Jomaa	Calibration Method of digital power meter 2503	A
7-12-1991	Mr. K. Barakat	Calibration Method of current transformers	A
8-12-1991	Mr. M. Haferi	Calibration method of digital multimeter 2502 A by using 2552	A
11-12-1991	Dr. Yamanochi	30 Minutes Forum: uncertainty(7), various sources of uncertainty	E
11-12-1991	Mr. Z. Sweed	Using and calibrating frequency counter Type:/MF63A/	A
18-12-1991	Mr. M. Haferi	Standard Resistor	A
23-12-1991	Mr. B. A. Addas	The Smith Chart	A

Continued table(7)

Date	Lecturer	Title	language
8-1-1992	Dr. Yamanochi	30 Minutes forum: uncertainty(8), various sources of uncertainty	E
8-1-1992	Dr. M. Aghbar	Measurements results	A
15-1-1992	Mr. M. K. Haj-Ebrahim	RF Power measurement	A
16-2-1992	Mr. E. Salhani	Calibration method of decade resistance box type 2793-01 2793-03 by using wheatstone Bridge 2768	A
4-3-1992	Dr. M. Aghbar	Frequency/Time coordination	E
9-3-1992	Mr. A. Manaa	Comparison and dissemination Computers and information technology	A
15-3-1992	Mr. H. Bastati	A general study about IBM. PC	A
22-4-1992	M. A.S. Karouni	The transportable reference "Zener dioele" DC. voltage standard	E
28-6-1992	Dr. M. Aghbar	*"Conference on precision electromagnetic measurements"*	E

The stability of this sample between 5-5-1992 to 30-6-1992 is 14 μ V.

The third generation prototypes are using cadmium sulfate (purity 80%). The instability during fifteen days, of one sample is ± 32 μ V , showing that we have surely to use pure cadmium sulfate (95 %).

VII-6-2- Decade Resistors :

A new decade resistor based on the design proposed by CPEM 88, is made. Its design is based on a minimum number of resistance elements connected in series and having nominal values R, 2R and 3R.

The first prototype is made using high stability metal film resistors and it consists of 4 decades, x 10 ohm, 100 ohm, 1k ohm, 10 k ohm.

The stability of this decade resistor, during one year, is within 0.01% .

The second generation (6 decades resistor) will use Alpha electronic precision resistors to achieve 0.01%; 0.1%, 0.5%.

VII-6-3- Standard Resistors :

NSCL made standard resistors using high stability thin film resistors manufactured by Alpha Electronic LTD and Vishay company. The nominal values of those standard resistors are 1kΩ , 10kΩ, 100kΩ , each of which consists of four resistors connected serial parallel between the two potential terminals (P.T.). The current terminals (C.T.) are connected to the (P.T.) by using a copper plate. The zero resistance value between (C.T.) and (P.T.) is Ro= 0.5 m Ω.

Table(8) gives the results of measurements conducted during one year.

Table(8) : Measurements results

Nominal value	Mean value	Standard deviation
1kΩ*	0.999974kΩ	4mΩ
1kΩ	0.999970kΩ	2mΩ
10kΩ	9.99963kΩ	0.03 Ω
100kΩ	99.9954kΩ	0.4Ω

* Vishay elements

VII-6-4- The Transfer Standard:

The role of the transfer standard is extremely important in the field of resistance measurement, in calibration of ratio of measuring instruments, and in resistance scaling.

The thin film high precision resistors "Hermetic" which are manufactured by Alpha Electronic LTD. have been used to build up 1kΩ step, 10kΩ step and 100kΩ step, transfer standards. The 11 high precision resistors are connected in series using the copper plate leads and shorting leads, so as to achieve$\sum$ Ri. The 11 resistors can be connected in parallel by using two shorting bars of copper plate, so as to achieve
R parallel = ($\sum$ 1/Ri).

Those three prototypes of transfer standards have been calibrated for 9 months, and the result of their stabilities are shown in the table below;

Table(9) : Stability of Transfer Resistance Standards

Function of Measurements	1kΩ step	10kΩ step
	100kΩ step	
R1 to R11 individually	2mΩ to 12mΩ	9mΩ to 23
	129 mΩ to 200mΩ	
R series $\sum$ Ri	31mΩ	83mΩ
	18Ω	
R parallel = ($\sum$ 1/Ri)	0.5mΩ	1mΩ
	11mΩ	

Ambient Temperature (24 ± 0.5) °C

VII-6-5 Solid-State; Zener Reference; Transfer DC Voltage Standard:

A zener-diode-based DC voltage standard can be an excellent transfer standard for the unit of DC voltage because of its stability against physical shock and temperature changes.

The problems of transporting a unit of voltage and the properties of available Zener standards will be studied to develop a set of characteristics which are considered to be essential for an optimum transport standard.

We are going to examine the performance of some of the high-quality commercially available Zener standards for possible use as a transport standard of voltage with transport accuracies of 2ppm or better.

The purpose of a voltage transport standard is to determine the difference between the units of voltage in any two laboratories.

Therefore we will define a voltage standard as a complete instrument in one box containing four independent units and powered by the AC line or internal batteries. Each unit continuously produces one or more stable voltages such as;: (10V, 1V and 1.018V).

The characteristics to be essential requirements of a Zener transport standard are:

1- Predictability of the output voltages .
2- Multiple independent outputs.
3- Battery operation .
4- Physical size and weight .
5- Sensitivity to applied AC .
6- Temperature coefficient of the voltage outputs .
7- Quality of the 1.018V output.

VII-6-6 Inductance Measurements:

The precision standard inductors are usually wound as toriods or solenoids on ceramic cores, and the position of connecting leads can greatly affect the measured value of low-valued inductors.

One of our customers sent 14 precision standard inductors to be calibrated at NSCL. According to their technical specifications, the accuracy of those inductors is 0.02% as stated. It was not possible to calibrate them because we do not have an appropriate inductance measuring system. It was then attempted set up some precision methods "such as the Maxwell-Wien bridge, hay bridge and series owen bridge" to measure the inductance using our own standard capaictor and resistors.

The results obtained so far is 0.05% at 1kHz , and we are going to improve it using standard decade inductors and capacitors which are not available yet, and some better connecting shaded leads.

VII-6-7 An Automation of the Standard Cells Comparisons:

The NSCL's standard cells "locally made" will be calibrated by comparing them directly to NSCL-owned primary standard cells using a series opposition method and redundant measurement design. Two cells are connected in series opposition (one unknown, one reference) and the small voltage difference is read using a digital voltmeter by a desktop computer.

A Fully-automated voltage measuring system will be used for all cell comparisons. Actually only the selection of standard cells as well as the connection to a digital voltmeter (DVM) are manually obtained.

The DVM takes a number of readings of the voltage difference (usually three); the selector switch reconnects the cells with reversed polarity; and the DVM takes three more readings.

The computer records the readings, and when the experimental design is complete, it calculates the estimates of the cell difference using a least-square method and records the cell emfs on the hard disk and on a floppy disk for back-up.

A summary of the basic statistics is printed after each measurement set.

VII-6-8 Triple point :

The prototype of water triple point container was manufactured at SSRC using glass (Pyrex, Duran Co.). The measurements conducted using our system of measurements (uncertainly ± 0.02°C) showed good stability but the value we measured was 0.06°C.

The shift from 0.01°C is probably due to the impurity of the water enclosed in the container.

VII-6-9 Device to measure Frequency Characteristics of Resistors :

The frequency characteristics of the YEW 2729, 1Ω resistor, in the range 50Hz to 1kHz, is very much needed . To study these characteristics we are accomplishing a home made device. We claim a resolution of about 100ppm which was confirmed by the preliminary measurements.

The second generation will be for a wider range of resistance.

VII-6-10 I/V Convertor :

NSCL actually do not have standards in the range (10 to 10)Ω. Mr. Matsumasa Inoue proposed and supervised the realization of a current to voltage convertor which can be used to calibrate resistors in the above mentioned range. The uncertainty claimed by NSCL is better than 5%. All theoretical study and practical measurements show that we can achieve2~1%.

VII-6-11 Electronic Household Watt Hour Meter :

The clasical type of watt Hour Meter is manufactured by a Syrian public company. Some problems related to the production line are facing them. In addition, the actual trend in the world is to use digital (electronic) watt hour meters.

Based on the JEMIC extensive experience for development of electronic meter for tarif purposes especially house hold electronic watt hour meters, NSCL began to develop under JEMIC pulse a prototype fit to the Syrian City line.

VII- 7 Collaboration :

In the time being NSCL is mainly collaborating with local organizations. In addition to our routine works (repair, calibration) NSCL is participating in educational activities like :

- teaching at the Higher Institute of Applied Siences and Technology (HIAST)
- Managing and teaching at the intermediate Institute of Electrical and Mechanical Engineering; as well as accepting trainees (16 students, for a stay of one week, are awaited next month).

NSCL is also benefiting significantly from SSRC infrastructure which enables its staff to pursue language courses, technical courses as well as the possibility of postgraduate studies (two of NSCL staff are expected to study abroad).

VII-8 Conference on Precision Electromagnetic Measurements "CPEM 92" :

The conference (held every two years) is considered as a forum in which scientists, metrologists and professionals throughout the world will have the opportunity to present, discuss, and compare their research results in the field of electromagnetic Measurements as well as Metrogoly in general.

The number of "CPEM 92" participants was more than 350 from 35 countries.

NSCL presented a paper, attachment(4), entitled:

State of National Standards and Calibration Laboratory .

This paper as well as the presence of two of NSCL staff in this conference had a very positive impact:

- It facilitated direct contact with very important national & international responsible specialists.
- It showed internationally that NSCL is existing.
- It gave NSCL axes of work which could be the basis of a paper to be presented in "CPEM 94".

VII-9 Forum on the state of Metrology in Syria :

Organized by the Arab School of Science and Technology and sponsored by

SSRC the forum on the state of Metrology in Syria, wacheld during 1-2 June, 1992. The number of participants was 63 from 15 different organizations.

Ten papers, attachment(4), were presented. They stimulated a positive discussion during the round table session. The most important conclusions, reached by participants are:

- The urgent need to establish a "Syrian Measurement Law"
- The composition of a National Committee (headed by SSRC) to deal with, and to propose adequate solutions related to metrology.
- The necessity of extending NSCL capabilities to Optical& Mechanical Standards and related Measurements.

VIII- Japanese Experts & Training in Japan

It is an opportune occasion to say that this project would not have achieved its current level without the very precious help of the Japanese experts and the fruitul training of NSCL's staff received in Japanese institutions, laboratories and companies.

The table hereunder gives the names and functions of Japanese experts as well as Syrian counter-parts, involved in realizing the annual work plan :

Name	Function	Period	Counterpart
Mr. S. Hatakeyama	Long term expert	11.6.91 to 10.92	Mr. M. Kubeitari
Mr. M. Inoue	Short term expert	11.6.91 to 11.10.91	Mr. A. Karouni
Miss Ch. Yamanochi	Team Leader	11.7.1991 to 10.92	Mr. M. Aghbar

Mr. Yoshitaka Sakumoto	JEMIC	Test/Calib.	20/8/91-21/12/91
Mr. Yoshio Nakamura	JMI	Apparatus Set up/Op.	20/8/91-6/9/91
Mr. Mitsuhiro Sakurai	Yokogawa	Repair	14/9/91-14/12/91
Mr. Satoru Tashiro	Yokogawa	Repair	3/12/91 -3/3/1992
Mr. Mutsumasa Inoue	JEMIC	AC	16/04/92-23/7/92
Mr. Sadatoshi Minoyama		Air conditioning system	18/7/92-14/8/92
Mr. Masaaki Maeda	JMI	RF Calibration	1/8/92-27/9/92
Mr. Jimpei Kato	Anritsu	RF Repair	1/9/92-20/9/92

On the other hand, four persons were trained in Japan.

Mr. M. Kubeitari
Mr. B. Abou Adas
Mr. B. Makieh
Mr. G. Sharani

They received individually satisfactory knowledge and practice in different specific fields.

We will highly appreciate the possibility of dispatching four experts in the following fields:

- RF
- AC & PR
- Repair
- DC (Study of our ultimate system`s stability)

On the other hand; NSCL`s Planning Board proposes the scheduled training to be in the following fields:

- RF
- Repair
- DC (How to get better results using the present systems, with small modifications).

IX- Third Country Training Program (TCTP)

NSCL`s Management Committee with the approval of SSRC direction is very eager to realize TCTP during 1993, for several reasons:

- It will surely demonstrate the capability of NSCL to Syria`s neighboring countries.
- It will open the possibility to NSCL to participate in regional cooperation in the field of Metrology.
- It will oblige NSCL`s staff to prepare themselves for such practice.
- NSCL could repeat the same course to raise the level of Syrian staff from different organizations or private sectors.

NSCL`s Planning Board meeting No. (69) discussed this matter and found the following proposal optimal.

Title: A Regional Training Course in Electrical Metrology.

Number of trainees : 21 trainees.

External lecturers : 2 - 4 lecturers. (to cover general subjects during at most 4 days).

Duration: 18 working days (14 practical + 4 days general) .

Proposed dates: (1 - 22) May/ 1993 from (9 AM to 4 PM) Friday : Holiday.

X- Proposals

JICA has implemented hundreds of projects all over the world. Many of those projects relate to common fields. We think it would be beneficial if the associated institution organs communicate and find ways to exchange knowledge and services, sponsored or organized by JICA.

The fields which are of great interest for NSCL are:

Metrology
Testing
Electronic training center

- *The National Electrical Standards in our region have never been* comparatively evaluated. We think it will be of very great impact if NSCL organizes such an evaluation especially for (voltage & resistance reference standards).

- The first project concerning NSCL will terminate before the end of 1992. We believe it is worth preparing a general description of NSCL to appear in a scientific journal puplished in Japan or elsewhere.

- We are very much willing to receive the supervision help of experts, and transfer of technology which could result from a collaboration between one Japanese laboratory (ETL, JEMIC, or other) and NSCL, to study and develop:
  Our actual capability , how to achieve 0.5 ppm in DC measurement (dispatch of expert and acceptance of Syrian staff to conduct necessary measurements).
  Solid state voltage reference
  Thin film multijunction thermal converter
  Electronic household single-phase watt-hour meter

  These matters as well as the mechanical and optical standards can be topics for an observation tour for a Syrian staff nember.

- We have received a lot of knowledge and know-how from Japanese experts, but we need to continue expanding our capability with Japanese experts support.
  In the present status the stay of a team leader as well as long term expert is of great importance especially to support the Syrian side and to facilitate immediate technical communication with Japanese organizations or institutions.
  On the other hand we believe it would be very benefitial for NSCL's staff if exchanges of staff with (JEMIC, JMI, ETL) could take place.

- In Syria almost all foreign companies do not possess service centers or even a technically equipped agent. Hence, NSCL could have a joint collaboration with some Japanese companies to play the role of this center (repair & calibration of electronic measuring instruments).

- One of the biggest problems we face is spare parts. SSRC will highly appreciate and cooperate with any foreign company to implement in NSCL an electronic store or any other mechanism facilitating the provision of spare-parts whenever needed.

- We are trying to take care of SSRC`s office machines specially photocopy-machines. This kind of service could be enlarged for outside companies. But, actually our staff are not skilled in such work and do not have the required technical documents. We would very much appreciate it if JICA could accept one trainee in this field.

- The Conference on Precision Electromagnetic measurements held every two years, is a very important source of imformation for NSCL. It is proposed that at least two of NSCL staff should attend this conference.

- JICA is annually conducting, a group training course entitled "Standards and Metrology".
  The acceptance of one of NSCL staff as a JICA participant will without doubt encourage and stimulate our staff.

- JICA is providing equipment or conducting project type cooperation with Syrian organizations and institutions. Thus a lot of measuring instruments or scientfic equipment are being provided and need in the future repair or maintenance.
  We think it will be good practice if NSCL can be involved in such JICA`s projects during implementation. Then we can assure the promotion of repair & maintenance efficiency.

- The need for NSCL`s services, in the Syrian cities, amplified during the forum "the State of Metrology in Syria", is pressing. We therefore reemphasize the need for an equipped service car (records of meetings of Feb. 1990, July 1991) which would allow NSCL to provide more effciently basic calibration/repair services inside Syria.

XI- NSCL`s future Prospectives

NSCL`s staff, with SSRC`s approval and support, will employ and exert all efforts:

- To preserve and maintain our National Standards; the question on how to maintain traceability should be answered as soon as possible. The list of our "Transfer Standards" is given in attachment(5). They have to be periodically calibrated in Japan or elsewhere.

- To set-up a training course for Syrian staff. TCTP will provide us with the necessary framewor to repeat it at least once a year.

- To find suitable solutions for spare parts. JICA`s support will facilitate enormously to put the solution in concrete form sach as by providing a

Attachment(1): The system used to execute Property Control

The system used to execute property control:

V-1 Every standard, measuring instrument, device or component has a property control number, which contains /10/ digits. These digits have been divided into four parts such as:

Main group - group - sub group - part number
XX XX XX XXXX

V-2 The main group digits refer to the class of device function, for example the standard and measuring instruments are designated by:

88-XX-XX-XXXX

V-3 The group digits refer to the main function of the standards measuring instruments, such as:

88-00-xx-xxxx standards
88-01-xx-xxxx DC. voltage and current
88-02-xx-xxxx AC. volltage and current
88-03-xx-xxxx comparators
88-04-xx-xxxx bridges and R,C,L, boxes
88-05-xx-xxxx generators and synthesizers
88-06-xx-xxxx analyzers
88-07-xx-xxxx temperature devices and thermometers
88-08-xx-xxxx digital and analog meters
88-09-xx-xxxx recorder and printers
88-10-xx-xxxx oscilloscopes
88-11-xx-xxxx converters
88-12-xx-xxxx attenuators

V-4 The sub-group digits refer to the description of the standard or the measuring instruments, such as:

88-00-00-xxxx saturated standard cell
88-00-10 xxxx double wall-sealed, 4-terminal st'd resistor

Acc + 20 ppm

88-00-31-xxxx dry-nitrogen standard capacitor
88-00-41-xxxx AC/DC thermal transfer standard
88-00-50-xxxx Rubidium frequency standard
88-01-14-xxxx DC voltage/current standard
88-02-01-xxxx AC voltage/current standard
88-03-00-xxxx direct current coparators bridge
88-04-04-xxxx decade resistance box

V-5 The part number digits refer to the type, value and accuracy of the standards or measuring instruments, such as:

88-00-12-0001 yew 2792,1 ohm st'd resist, 150 ppm
88-00-15-0000 yew 2793,1M ohm, st'd resist, + 100 ppm
88-00-11-0003 yew 2794,100 ohm, st'd resist, + 20 ppm
88-07-02-0000 yew 2455, digital thermometer

V-6 The electrical and electronic components have the property control number which also consists of /10/ digits, divided into four parts as mentioned before.

Three main groups (89-90-91) are reserved for them, for example: Semiconductors and active components are designated by the main group numbers 89 and 90.

V-7 Again the group digits refer to the kind of the device (component), such as:

89-00 to 19-xx-xxxx for diode
89-20 to 44-xx-xxxx for transistors
89-45 to 54-xx-xxxx for thyristors
89-55 to 74-xx-xxxx for linear ICs.
89-75 to 91-xx-xxxx for digital ICs.
89-92 to 99-xx-xxxx for interface ICs.
89-00 to 09-xx-xxxx for interface ICs.
90-00 to 09-xx-xxxx for interface ICs.
90-10 to 14-xx-xxxx for memory ICs.
90-18 to 24-xx-xxxx for microcomparator ICs.

V-8 The sub-group digits refer to the description of the device such as:

89-02-01-xxxx germanium diodes, VRRM = 5- 200V, Io= > 100 mA
89-30-04-xxxx Si-PNP-Low power TR. VCEO > 50 V
89-57-10-xxxx OP-Amp, single-chopper-stabilized, IB > 10 pA
89-82-05-xxxx D-type flip-flops, 1-Bit, ECL
89-84-53-xxxx Gates, AND-OR-Invert, 2-2 I1P, CMOS

V-9 The part number digits refer to the type and technical specification of the device.

V-10 The main group number /91/ is designated for passive components, such as: Resistors, etc...

V-11 The group digits refer to the class of passive devices such as :
91-00 to 21-xx-xxxx for resistors.
91-25 to 29-xx-xxxx for capacitors.
91-30 to 35-xx-xxxx for fuses and fuse holders.
91-36 to 39-xx-xxxx for switches.

V-12 The sub-group digits refer to the kind "materials, technology and some technical specifications" such as :

91-01-02-xxxx High stab. carbon film resistors, 0.5w, + 5 %
91-02-04-xxxx Metal film resistors, 0.125w, + 1 %
91-08-13-xxxx Ceramic wire wound resistors, 1w, + 10 %
91-25-30-xxxx Electrolytic capacitors, Wire indeed axial, 100v
91-27-00-xxxx Solid tantalum capacitors, 6.3V, lead type
91-28-20-xxxx Metallic polyester film capacitors encapsulated, axial leads 250V
91-29-22-xxxx Disc ceramic capacitors, 25V

V-13 The part number digits refer to the value power rating voltage and tolerance.

Attachment(2): List of NSCL Customers

LIST OF NSCL CUSTOMERS

1 - Syrian Arab Company for Electronic Industries	(Syronos)
2 - Syrian Society of Production and Commercialization of Telecommunication equipments	(Syrcotel)
3 - Syrian Glass Company	(Syr.G.C)
4 - Atomic Energy Commission	(A.E.C)
5 - Industrial Testing and Research Centre	(I.T.R.C)
6 - Syrian Petroleum Company W.S 420	(S.Pet.C)
7 - Faculty of Science	(Fac.Sc)
8 - Faculty of Engineering	(Fac.Eng)
9 - Scientific Studies & Research Centre	(S.S.R.C)
10 - Higher Institute for Applied Sciences and Technology	(H.I.A.S.T)
11 - City Council	(Cit.Cn)
12 - Ministry of Communication (W.S & 638)	(W.S.638)
13 - Syrian Arab Airline Company	(Syr.A.C)
14 - General State for T.V. broadcasting	(ORTAS)
15 - General Company for Land Reclamation	(G.C.L.R)
16 - General Company for Cable Industry	(G.C.C.I)
17 - General Organizations for Euphrate Dam	(Euph.dam)
18 - Tichrin Power Station	(T.P.S)
19 - Ministry of Environment	(M.E)
20 - Ministry of Irrigation	(M.I)
21 - Oil Factory	(Oil.F)
22 - Foreign, Ministry	(F.M)
23 - Saymoza for Informatique Instruments co.	(Saymoza)
24 - Faculty of Civil Engineering	(Fac.C.E)
25 - National Hospital	(N.H)
26 - Ministry of Transport (W.S 49)	(W.S.49)
27 - General Company for Conserved Production	(G.C.C.P)
28 - General Converting Industries Cooperation	(G.C.I.C)
29 - Syrian Documentation Centre	(S.D.C.)
30 - Ministry of Interior	(M.I)
31 - Ministry of Electricity	(M.E)
32 - People Palace	(P.P)
33 - JICA, Damascus Office	(JICA)
34 - Ministry of Education , Kuneitra Department	(Kun.Dep)
35 - General Establishment for Electricity	(G.C.EL.)
36 - General Company For Textiles	(G.C.Tex)
37 - Industrial Secondary School (3)	
38 - Industrial Secondary School (4)	
39 - Industrial Secondary School (5)	
40 - Industrial Secondary School (1)	
41 - Feminine Industrial Secondary School	
42 - Cement Factory "Adra"	
43 - General Establishment for Communication and Telecommunication	
44 - Paper Factory (Deir Al Zour)	
45 - National Authority for Survey	
46 - National Authority for Survey	(W.S 740)

47- General Establishment for Communication and Telecommunication (W.S 140)
48- Ministry of Communication (W.S 600)
49- General Establishment for Electricity "Damascus Department"
50- Mimistry of Transport (W.S 720)
51- MATA H
52- Intermediate Institute for Mechanical and Electrical Engineering (Ministry of Higher Education)
53- Rubber & Plastic Production Company
54- Syrian Crude Oil Transportation Company (SCOTRPCO)
"Establishment for International Trade"
55- General Foreign Trade Organization for Metals and Building Materials (MAADEN)

Attachment(3): State of National Standards & Calibration Lab. (NSCL), Syria

STATE OF NATIONAL STANDARDS AND CALIBRATION LABORATORY (NSCL), SYRIA

M.Aghbar, M.Kubeitari, C.Yamanouchi

National Standard and Calibration Laboratory
Scientific Studies and Research Center
P.O. Box 4470,Damascus-Syrian Arabic Republic

Abstract

Syria began several years ago to establish its National Measurement System . It was clear that such a goal could not be achieved without maintaining National Standards (non specified prior to 1989 the year when the National Standards and Calibration Laboratory, NSCL, was inaugurated). This paper describes the present status of NSCL as well as its activities.

Introduction

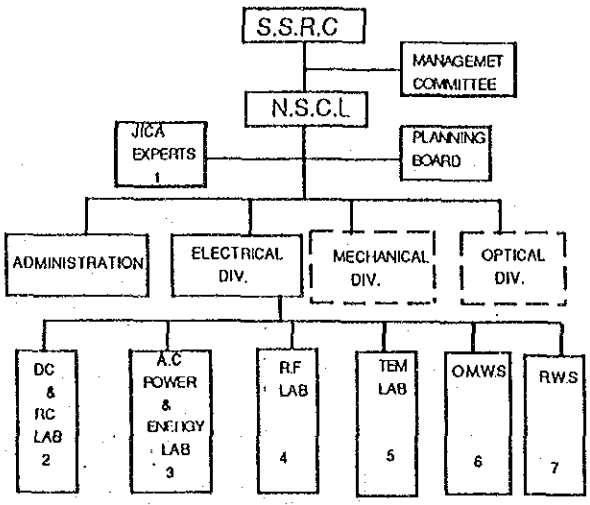
It is well known that no industry will survive in a country where a clear and strong measurement infrastructure is not implemented, in order to insure fair measurement in trade and commerce [1].

Syria began, several years ago, the preparation for such infrastructure. One of the most important elements of this structure is a laboratory (keeper of National Standards) in whom customers may have entire confidence and recognize the ability of its staff in conducting precise (relatively to Syrian needs) measurement.

Hence, the National Standards and Calibration Laboratory (NSCL) was created within the Scientific Studies and Research Center (SSRC) to maintain primary Syrian (National) Standards, to conduct relevant measurements and to ensure the function of the top Syrian hierarchy of physical units and standards.

NSCL maintains now standards of electrical and thermal quantities in addition to frequency. NSCL Fig1 consists of six sections where routine calibration works are performed.

Some of those sections have started original works which will be specified through this paper.



1- JICA: Japan international cooperation agency
2- DC & RC: direct current & resistance capacitance
3- AC: alternating current
4- R.F: radio frequency
5- TEM: temperature
6- O.M.W.S : office machine work shop
7- R.W.S: repair work shop

Fig. 1 NSCL ORGANIZATION

Uniformity of measurement

Syria is planning to join the " Convention du Metre" when formal exchanges of documents recognizing the equivalence of Syrian Standards to others are obtained.

NSCL began bilateral collaboration with some well known laboratories like JEMIC (Japan Electric Meters Inspection Corporation) and JMI (Japan Machinery and Metals Inspection Institute) to seek the evaluation of our standards and measuring systems.

In this paper we will limit ourselves to the evaluation of DC system (the transfer standard being Fluke 732A), frequency system (the transfer standard being rubidium NEC RB1008C) and resistance measuring system (the transfer standard being YOKOGAWA 2794), although the evaluation covered several other systems.

The very first results show that the overall uncertainty of measurements is 3ppm , 5ppm for Fluke 732A (1.018 range) and YOKOGAWA 2794 respectively. The dominant contribution to the present uncertainty results from NSCL's references.

NSCL 's Activities

Table 1 summarizes the calibration services NSCL is providing. NSCL is also providing repair of electronic measuring instruments to minimize the shortage Syria is suffering.

NSCL produced some samples of saturated standard cell[2] as well as fixed resistors and decade resistors[3].

on the other hand NSCL is working out the possibility of performing (summer 1992) a "Third Country Training Programme" addressed to specialized staff of those countries which have just started or intend to start a similar experience.

Table.1 NSCL's Calibration Services

Item	Calib Range	Note	Cal Acc
Std. Res.	1Ω	bath stab 1mK	2ppm
Std. Res.	1mΩ to 10MΩ	bath Stab 1mK	(5 to 50)ppm
Std cells.	1.018xxxxV	bath stab 1mK	2μv
Std cap.	10pF to 11μF	1kHz	100ppm
Cap.Meas.	1pF to 10μF	1kHz	(10 to 100)ppm
Std.Shunts	Up to 30A/100A	DC/AC	100ppm
Bridge/Boxes	Up to $10^8\Omega$		(5 to 200) ppm
Voltage. Cal'r	Up to 1000V	DC	(3 to 20)ppm
Cur. Cal'r	Up to 100A	DC	(20 to 200)ppm
DVM	Up to 1000V		(3 to 20)ppm
Volt./cur. Cal't.	Up to 1000V/100A	50Hz to 20kHz	0.01%
D.V.M	Up to 1000V	50Hz to 20kHz	0.05%
Cur/Pot.trans.	Up to 1000A/6.6kV	50 Hz	0.1%
AC/DC Trans.	Up to 1000V	50Hz to 20kHz	0.01%
PWM	UP to 500V X 30A	50Hz	(0.05 to 0.1)%
WHM	220V/ 5,30,40,120A	50 Hz	0.3%
RTD	(0 to 630)°C		0.04°C
Thermocouples	Up to 1100°C		1.5°C
Freq.Std	1.5Hz to10MHz		Stab 10^{-10}/mon
RF PW. Meas.	(-20 to15)dbm	100kHz to 1GHz	05dB
Att. Meas	(0 to70)db	500kHz to 1GHz	(0.2 to 2)dB
Imp. Meas.	R.L. (2 to 35)dB	10MHz to 1GHz	(0.2 to 2)dB
Sig. Gen.	(-110 to 10)dBm	100kHz to 1GHz	1dB
Count/RF Gen	0.1MHz to 1.5 GHz		Stab 5.10^{-8}/mon

References

[1] W.R.Blevin, "Australia's National Measurement System", in proceedings of the Conference on Precision Electromagnetic Measurements, 1988, pp,250-251.

[2] H.Hirayama and K.Shimazaki, "Standard cells with cd-pb amalgam electrode", IEEE Trans Instrum, Meas., 1972 vol. IM-21, pp, 319-323.

[3]Ibrahim M.H.Saad, "Theory and Design of A new series of Decade Resistors", in Proceedings of Conference on Precision Electromagnetic Measurements, 1988,pp 168-169.

Attachment(4): Forum on the State of Metrology in Syria

ARAB SCHOOL
OF
SCIENCE & TECHNOLOGY

Forum on

STATE OF METROLOGY IN SYRIA

Sponsored by

Scientific Studies & Research Center (Syria)

June 1 - 2 , 1992
Higher Institute for Applied Science & Technology
Damascus , Syria

III-44

Scedule of Forum : State of Metrology in Sytian Arab Republic

Monday 1 / 6 / 1992			Tuseday 2 / 6 / 1992		
TIME	SUBJECT	LECTURER	TIME	SUBJECT	LECTURER
9:00- 9:30	Registration and opening		9:00-9:45	Role of the university in showing the	Dr. A. A. Avar
9:30-10:15	Metrological legalities and the role of	Mr. A. Hadid		measurements necessity, quality control,	FMEE*
	SASMO	SASMO*		and prepairing the qualified engineers	
10:15-11:00	State of monitoring the legal instruments	Dr. A. A. Baroudi			
	in Syria	Ministry of Provisions	9:45-10:30	Quality controll in production	Mr. Z. Salhani
11:00-11:30	Brack				SSRC*
11:30-12:15	Metrological system according to the	Mr. G. Alabed	10:30-11:00	Break	
	traceability of standards	ITRC*	11:00-11:45	Role of the national standards in quality	Dr. M. Aghbar
12:15-13:30	Visit the NSCL			assurance of production	NSCL*
13:30-15:00	Lunch		11:45-12:30	Japanese Measurement Law	Dr. Yamanouchi
15:00-15:45	The metrological laboratory existing in	Dr. Z. S. Soulaiman	12:30-13:15	The role of JEMIC	Mr. Hatakeyama
	Syria and the ability of supporting them to		13:15-14:30	Lunch	
	built the complementary metrological		14:30-16:30	Round table (Discussion)	
	system		16:30-17:00	Conclusion	
15:45-16:30	State of radiation standards in Syria	Dr. T. Yasiin			
		AEO*			

* SASMO: Syrian Arab Standardization and Metrology Organization
ITRC: Industrial Testing and Research Center
AEA: Atomic Energy Agency
FMEE: Faculty of Mechanical and Electrical Engineering

Attachment(5): NSCL`s transfer standards

NSCL's TRANSFER STANDARDS

NO.	TYPE	DESCRIPTION	MANUFACTURER	Qt	Sec
1	732A	DC Reference Standard	Fluke	1	DC
2	2781	Double-wall Standard Resistor	YEW	3	DC
3	1404A/1000PF	DRY-Nitrogen Standard Capacitor	G.R.	2	DC
4	540 B	AC-DC Transfer Standard Current Shunt (1mA)	Fluke	1	AC
5	DT72	AC Voltage Divider, Decade Transformer	E.S.I	1	AC
6	R800-1 RTD (PT-25)	Standard Temperature Sensor	Chino	2	TEM
7	C800-15	Thermocouple type "s"	Chino	2	TEM
8	Rb-1008C	Rubidium Frequency Standard	N.E.C	1	RF
9	ML8403A	Power Meter	Anritsu	1	RF
10	MA4601A	Power Sensor	Anritsu	2	RF
11	MA4702A	Power Sensor	Anritsu	2	RF
12	MP721A	3dB Attenuators	Anritsu	3	RF
13	MP721B	6dB Attenuators	Anritsu	3	RF
14	MP721C	10dB Attenuators	Arnitsu	3	RF
15	MP721D	20dB Attenuators	Arnitsu	3	RF
16	MP752A	Termination	Wiltron	3	RF
17	MP752B	Termination	Wiltron	3	RF
18	CG 5001	Programmable Calibration Generator	Tektronix	1	REP
19	YEW2885	Standard Watt Convertor	YOKOGAWA	1	AC

Attachment(6): Recommended Accessories and Equipment

No.	Description	Type	Manufactures	Qt	Section
1	Double wall std. Res.	2781	Yokogawa	3	DC
2	Range Extender	9923 & 9606	Giude line	1	DC
3	Winding Machine	M01B	Meteor	1	Rep
4	Ratio transformer bridge			1	DC & AC
5	Null Dctector	GR1238	Gen Rad	1	AC
6	Differential VM	93113	Fluke	1	AC
7	AC Generator DC up to 100kHz variable phase			1	AC
8	Precision decade capacitor	1423-A	Gen Rad	1	DC
9	Decade inductor	1491-G	Gen Rad	1	DC
10	Microwave Freg. Counter	MF76A-03	Anritsu	1	RF
11	Motorized thermal Selector switch	SP2/p/MB	CROPICO	1 1	DC DC
12	Std. Inductor	1482L	Gen Rad	1	DC
13	Coaxial Cap. Std.	1406 A/D	Gen Rad	1	DC
14	Calibration System to calibrate liquid Thermometers		Chino	1	TEM
15	Hygrometer Calibration System			1	TEM
16	Burden Resistor	279112	Yokogawa		AC
17	Passive standard Shunt (10mΩ, 100mΩ)		Fluke		DC
18	Electronic WHM	279112	Toshiba	2	AC
19	Sampling Oscilloscope Shunt (10mΩ, 100mΩ)	790CA/7511/II 11/S-6	Tek.	1	Rep
20	Time & Frequency Monitorin System	5000A	Trimble Navigation	1	RF

Annex 2-(1). Evaluation Sheet

SUMMARIZED TABLE OF EVALUATION

Item of evaluation			No. of sheet	Average Score
1. Accomplishment of Target	Attainment of Objectives of the Project		2-(2)	100
	INPUT	Japanese Side	2-(3)-1	100
		Syrian Side	2-(3)-2	94
	OUTPUT	Transfer of Technology	2-(4)-1	91
		Accomplishment	2-(4)-2	90
2. Impacts of the Project			2-(5)	98
3. Sustainability of NSCL			2-(6)	93

III-50

Annex 2-(2). Evaluation Sheet

ATTAINMENT OF OBJECTIVES OF THE PROJECT

Long-term Objectives	Present Condition	Evaluation				Rate	Score
		4	3	2	1		
Establishment of national measuring standards and NSCL Labs.	Facilities and management of Lab. are excellent. The national standards are established.	•				30	120
Operation of calibration services	Calibration services have been conducted since Apr. 1989.	•				30	120
Operation of repair services	Repair services have been conducted since Apr. 1989.	•				20	80
Promotion of traceability system	Success in promoting the traceability system in Syria	•				20	80
AVERAGE SCORE: 100							

* EVALUATION: 4: EXCELLENT (81-100), 3: GOOD (61-80), 2: FAIR (41-60), 1: POOR (<40)

Rate : Weighing of evaluation on each object/item

Score : Evaluation degree x Rate

Average score : (total score/400) x100

Annex 2-(2)-i

NSCL Primary Standards; Target and Accomplishment of Target

1. Target

The target of the highest accuracy of NSCL Primary Standards as planned was as follows;

(a) DC Voltage Standard	±2 ppm
(b) Resistance Standard	±5 ppm
(c) Capacitance Standard	±20 ppm
(d) Temperature Standard	±0.1°C
(e) AC Voltage Standard	±0.05 %
(f) Electric Power Standard	±0.05 %
(g) Frequency Standard	5×10^{-10} / day

2. Accomplishment of Target

a) Evaluation method

The evaluation of NSCL Primary Standards established and maintained based on so-called Round-Robin Calibration (circulation calibration).

The transfer standards which had been calibrated by Japanese Standards organizations (JEMIC & JMI) were provided to NSCL. Then Syrian counterparts calibrated these transfer standards in comparison with NSCL Primary Standards using NSCL calibration procedures . After calibration, the transfer standards were sent back to Japan with NSCL calibration reports, and were calibrated again by Japanese standards organizations (JEMIC & JMI).
After that Japanese team studied NSCL, JEMIC & JMI calibration data and evaluated the NSCL Primary Standards.

b) Results

Above mentioned evaluation method was applied to the evaluation of DC voltage, Resistance, Capacitance and Temperature Primary Standards. The quality of measurements depends on the environment in which they are used, the procedure used, the training of the operator and the treatment of measurement data.
The results of the Round-Robin calibration show the factors mentioned above guarantee the good measurements in NSCL.
Concerning the AC Voltage, Electric Power and Frequency Standards, the NSCL primary standards were transferred to Japan and recalibrated. So the above mentioned evaluation method could not be applied. The results of recalibration showed that their long term stability was fine.
Finally the target was satisfactorily accomplished.
The detailed calibration data are shown in the following :

(a) DC Voltage Standard

FLUKE 732A Standard Voltage Generator

Cal. Lab. / Date / Voltage	JEMIC	NSCL	NSCL	NSCL
	1991. Mar.	1991. Oct. 10	1991. Oct. 28	1991. Nov. 26
10V	10.000003	9.999998	9.999987	9.999986
1.018V	1.0180003	1.018001	1.018002	1.018001
1V	1.0000003	1.000002	0.999998	1.00000

(V)

Cal. Lab. / Date / Voltage	NSCL	NSCL	NSCL	JEMIC
	1991. Dec. 23	1992. Feb. 1	1992. Mar. 17	1992. Jun. 11
10V	9.999989	9.999981	10.00000	10.00001
1.018V	1.0180003	1.018000	1.018003	1.018005
1V	1.000001	0.999999	1.000000	1.000000

(V)

(b) Resistance Standard

Standard Resistor

Cal. Lab. / Date / R. Value	JEMIC	NSCL	NSCL	NSCL
	1991. Sep	1991. Nov. 10	1991. Dec. 14	1992. Jan. 8
0.1Ω	0.09999916	0.099999.	0.0999987	0.0999987
1Ω	0.9999958	0.999996	0.999997	0.999997
10Ω	10.000198	10.00017	10.00019	10.00019
100Ω	99.99971	99.9996	99.9996	99.9995

(Ω)

Cal. Lab. / Date / R. Value	NSCL	NSCL	NSCL	JEMIC
	1992. Jan. 26	1992. Feb.23	1992. Mar. 14	1992. Jun.
0.1Ω	0.0999988	0.0999988	0.0999988	0.09999942
1Ω	0.999997	0.999998	0.999998	1.0000041
10Ω	10.00019	10.00020	10.00020	10.000272
100Ω	99.9995	99.9997	99.9997	100.00013

(Ω)

(c) Capacitance Standard

Standard Capacitor

Cal. Lab. / Date / C. Value	JEMIC	NSCL	NSCL	NSCL
	1991. Mar.	1991. Sep. 24	1991. Oct. 5	1991. Oct. 29
1000pF	1000.01	1000.02	1000.03	1000.03

(pF)

Cal. Lab. / Date / C. Value	NSCL	NSCL	NSCL	JEMIC
	1991. Dec. 1	1992. Jan. 21	1992. Mar. 3	1992. Jun.
1000pF	1000.02	1000.03	1000.03	1000.01

(pF)

(d) Temperature Standard

(d)-1 Platinum Resistance Thermometer Sensor

Cal. Lab. / Date / Temp. (℃)	NSCL		NSCL		JEMIC
	1991. Oct. 27		1992. Jan. 11		1992. Jun. 18
	0, 100, 300	0, 200, 420	0, 100, 300	0, 200, 420	
-182.962					6.2073
0	25.4785	25.4785	25.4772	25.4772	25.4868
0.01					25.488
100	35.4876	35.4856	35.4888	35.4842	35.4996
200	45.1908	45.1880	45.1923	45.1894	45.2084
300	54.5936	54.5917	54.5933	54.5982	54.6188
400					63.7319
419.527					65.4769
419.58	65.4446	65.4452	65.4393	65.4614	(65.4812)

(Ω)

(d)-2 Type S Thermocouple

Cal. Lab. / Date / Temp. (℃)	NSCL	NSCL	JEMIC
	1991. Nov. 12	1992. Jan. 18	1992. Jun. 10
0	0.0000	0.0000	0.000
100	0.6442	0.6447	0.644
200	1.4401	1.4411	1.439
300	2.3221	2.3221	2.321
400	3.2595	3.2580	3.259
500	4.2318	4.2318	4.232
600	5.2330	5.2339	5.235
700	6.2706	6.2712	6.268
800	7.3404	7.3416	7.337
900	8.4425	8.4450	8.443
1000	9.5770	9.5814	9.581
1100	10.7440	10.7507	10.750

(mV)

(e) AC Voltage Standard

Thermal Transfer Standard

AC/DC Difference (%)

Cal. Lab. / Date / Test Voltage (V)	JEMIC	
	1991, Mar., 28	1992, Jun., 8
200	-0.002	-0.002
100	0.000	0.000

Test Frequency : 50 Hz

(f) Electric Power Standard

Standard Watt Converter

Test Voltage (V)	Test Current (A)	Nominal Output Voltage (V)	Cal. Lab. / Date	JEMIC Actual Output Voltage (V)	
				1991, Jan., 18	1992, Jun., 19
300	5	1		0.9999	0.9995
150	5	1		0.9999	0.9994
100	5	1		1.0000	0.9993

Test Power-factor : 1

Test Frequency : 60 Hz

(g) Frequency Standard

Rubidium Frequency Standard

Cal. Lab. / Date / Nominal Value (MHz)	JMI	
	1991, MAR., 20	1992, JUN., 5
1	1.0000000000	1.0000000001

(MHz)

Attenuator

Type \ Cal. Lab. / Date	Freq.	JMI	NSCL	NSCL	NSCL	NSCL	JMI
		1991,Mar., 22	1991,Sep.,28	1991,Oct.,27	1991,Nov.,20	1991,Dec.,21	1992,Jun.,2
MP721A	10MHz	2.88	2.87	2.87	2.87	2.88	2.88
	100MHz	2.87	2.89	2.88	2.88	2.88	2.88
	1000MHz	2.90	2.99	2.92	2.88	2.87	2.92
MP721B	10MHz	5.91	5.90	5.90	5.89	5.90	5.90
	100MHz	5.91	5.92	5.92	5.91	5.91	5.91
	1000MHz	5.95	5.97	5.94	5.92	5.89	5.94
MP721C	10MHz	9.91	9.91	9.91	9.91	9.90	9.91
	100MHz	9.91	9.93	9.92	9.92	9.91	9.92
	1000MHz	9.94	9.97	9.93	9.93	9.93	9.95
MP721D	10MHz	19.96	19.96	19.97	19.96	19.97	19.94
	100MHz	19.96	19.98	19.98	19.96	19.98	19.98
	1000MHz	19.99	20.01	20.01	19.96	19.98	20.00

(dB)

Termination

Type	Freq. \ Cal. Lab. / Date	JMI	NSCL	NSCL	NSCL	NSCL	JMI
		1991,Mar., 19	1991,Sep.,27	1991,Oct.,28	1991,Nov.,20	1991,Dec.,21	1992,Jun.,3
MP752A	10MHz	1.027	1.0289	1.0290	1.0284	1.0288	1.025
	100MHz	1.025	1.0238	1.0240	1.0235	1.0238	1.025
	1000MHz	1.033	1.0327	1.0320	1.0325	1.0325	1.032
MP752B	10MHz	1.029	1.0345	1.0335	1.0331	1.0329	1.029
	100MHz	1.029	1.0318	1.0295	1.0294	1.0294	1.029
	1000MHz	1.033	1.0332	1.0360	1.0361	1.0347	1.032

Annex 2-(3)-1. Evaluation Sheet

INPUT (Japanese Side) *

Item	Attainment 4 3 2 1	Score (Rate)
Dispatch of Long-term Experts 1987 1988 1989 1990 1991 1992 Field J D J D J D J D J D J D J D 1.Chief advisor ————————————— 2.Measuring std. ——— ——— ——— ———	O	80 (20)
Dispatch of short-term Experts Field 1.Measuring standards,Repair envirenmental conditioning a:Air con. a — a- b:DC, c:R.C b,c,e — — b— b— d:Temp., e:AC d — f— f:W-Wh, g:RF g f— f— h:Freq. g,h,ir — h— i:Repair g — i — i— i—i-	O	80 (20)
Counterparts Training in Japan Field 1.Measuring standards ——— — — — — — —Research 2.Repair — — — —	O	120 (30)
Donation of Equipments Year Amount(million yen) 1987 290 1988 174 1989 135 1990 124 1991 9 1992 22	O	120 (30)
AVERAGE SCORE : 100		

*Details are shown in Annex 3 to 5 .

Annex 2-(3)-2. Evaluation Sheet

INPUT (Syrian Side) *

Subjects	Attainment 4 3 2 1	Score (Rate)
Land, Buildings and Facilities 1987 1988 1989 1990 1991 1992 J D J D J D J D J D J D	○	100 (25)
Allocation of Counterpart 1.Director 2.Exec.,Tech.Manager 3.Division chief 4.DC Section (S.C)** (Staff) 6.Temp. Section (S.C) (Staff) 7.AC Section (S.C) (Staff) 9.RF Section (S.C) (Staff) 11.Repair Sect. (S.C) (Staff)	○	120 (30)
Organizational arrangement	○	80 (20)
Budget of NSCL Operation Year Amount(S.P) 1987 3,851,150 1988 27,021,180 1989 4,675,950 1990 4,752,299 1991 4,832,166 1992 11,350,000 (Scheduled)	○	75 (25)
AVERAGE SCORE : 94		

* Details are shown in Annex 6-1 to Annex 8-2.
** S.C. : Section Chief

Annex 2-(4)-1 Evaluation Sheet

OUTPUT(1): SUMMARIZED TABLE OF TRANSFER OF TECHNOLOGY

No. Subjects	Average score	Rate	Score
A. Operation of calibration system	. 95	35	. 3325
B. Maintenance of measuring instruments	. 100	35	. 3500
C. Repair of measuring instruments	. 75	20	. 1500
D. Control of measuring instruments	. 75	10	. 750
AVERAGE SCORE: 91			

Annex 2-(4)-1-I. Evaluation Sheet

OUTPUT(1): Transfer of technology

I : Operation of calibration system : DC, RC, Temp, AC, W-WH, RF, Freq

No. Subjects	Comments	Evaluation				Rate	Score
		4	3	2	1		
A1: Set-up of Cal. System	Set-up of Cal. system and transfer of technology were completed as planned.	•				30	120
A2: Set-up of Environmental Conditioning	Set-up and transfer of technology was completed as planned.	•				30	120
A3: Preparation of Cal. Procedures	Transfer of technology was completed as planned.		•			10	30
A4: Preparation of Record Formats	Transfer of technology was completed as planned.		•			10	30
A5: Practice of Cal. Service	Basic training has been executed.	•				20	80
AVERAGE SCORE: 95							

Annex 2-(4)-1-ii Evaluation Sheet

OUTPUT(1): Transfer of technology

ii: Maintenance of measuring standards: DC, RC, Temp, AC, W-Wh, RF, Freq Lab.

No. Subjects	Comments	Evaluation				Rate	Score
		4	3	2	1		
B1: Accuracy checking of measuring instruments	Transfer of technology was completed as planned.	•				20	80
B2: Calibration of lower level measuring instruments	Transfer of technology was completed as planned.	•				20	80
B3: Periodic Cal.	Transfer of technology was completed as planned.	•				30	120
B4: Use of Transfer Standards, Check and Calibrate National Standards	Japanese side offered the opportunity to calibrate the primary standards.	•				30	120
AVERAGE SCORE : 100							

Annex 2-(4)-1-iii. Evaluation Sheet

OUTPUT(1): Transfer of technology

iii: Repair of measuring instruments; Multimeters & Recorders, Oscilloscope, Signal Generator Benches.

No.	Subjects	Comments	Evaluation 4	3	2	1	Rate	Score
C1:	Practice of troubleshooting	Basic training has been executed. More practice are required in RF field.		•			30	90
C2:	Practice of adjustment and calibration	Basic training has been executed. More practice are required in RF field.		•			30	90
C3:	Preparation of repair report	Transfer of technology was completed as planned.		•			20	60
C4:	Practice of repair service	Basic training has been executed.		•			20	60
AVERAGE SCORE : 75								

Annex 2-(4)-1-iv. Evaluation Sheet

OUTPUT(1): Transfer of Technology

iv. Control of measuring instruments: Cal Labs and Repair Benches.

No. Subjects	Comments	Evaluation				Rate	Score
		4	3	2	1		
D1: Property control	Japanese experts emphasized the necessity of those subjects and recommended the use of the SSRC Property control method .		•			40	120
D2: Service manual control			•			30	90
D3: Maintenance rule for tools and aux. equipments, periodic check			•			30	90
AVERAGE SCORE : 75							

Annex 2-(4)-2. Evaluation Sheet

OUTPUT(2): SUMMARIZED TABLE OF ACCOMPLISHMENT

No. Subjects	Average score	Rate	Score
A. Operation of calibration system	93	30	2790
B. Maintenance of measuring instruments	100	30	3000
C. Repair of measuring instruments	75	30	2250
D. Control of measuring instruments	100	10	1000
AVERAGE SCORE: 90			

Annex 2-(4)-2-i. Evaluation Sheet

OUTPUT(2): *Accomplishment*

i : Operation of calibration system : DC, RC, Temp, AC, W-WH, RF, Freq

No. Subjects	Comments	Evaluation				Rate	Score
		4	3	2	1		
A1: Set-up of Cal. System	Cal. system was installed as planned and maintained in good condition.	•				30	120
A2: Set-up of Environmental Conditioning	Environmental conditioning for *precision measurements* was completed and maintained in good condition.	•				20	80
A3: Preparation of Cal. Procedures	Technical documents were prepared in each section.		•			20	60
A4: Preparation of Record Formats	Technical documents were prepared *in each section*		•			10	30
A5: Practice of Cal. Service	Cal. services have been managed very well	•				20	80
AVERAGE SCORE: 93							

Annex 2-(4)-2-ii. Evaluation Sheet

OUTPUT(2): Accomplishment

ii: Maintenance of measuring standards: DC, RC, Temp, AC, W-Wh, RF, Freq Lab.

No.	Subjects	Comments	Evaluation 4	3	2	1	Rate	Score
B1:	Accuracy checking of measuring instruments	Accuracy checking has been carried out as planned.	•				25	100
B2:	Calibration of lower level measuring instruments	Scheduled calibration has been conducted in each section.	•				25	100
B3:	Periodic Cal.	Scheduled calibration has been conducted in each section.	•				25	100
B4:	Use of Transfer Standards, Check and Calibrate National Standards	Recalibration of primary standards was carried out with transfer standards.	•				25	100
AVERAGE SCORE : 100								

Annex 2-(4)-2-iii. Evaluation Sheet

OUTPUT(2): Accomplishment

iii: Repair of measuring instruments: Multimeters & Recorders, Oscilloscope, Signal Generator Benches.

No. Subjects	Comments	Evaluation				Rate	Score
		4	3	2	1		
C1: Practice of troubleshooting	Counterparts have great skill in repair work.		•			30	90
C2: Practice of adjustment and calibration	Counterparts have great skill in repair work.		•			30	90
C3: Preparation of repair report	Technical documents have been prepared in each work shop.		•			10	30
C4: Practice of repair service	Repair services have been managed very well		•			30	90
AVERAGE SCORE : 75							

Annex 2-(4)-2-iv

OUTPUT(2): Accomplishment

iv. Control of measuring instruments: Cal Labs and Repair Benches.

No. Subjects	Comments	Evaluation				Rate	Score
		4	3	2	1		
D1: Property control	Property control has been managed very well.	•				40	160
D2: Service manual control	Technical documents were stored in the library and opened for the staff concerned.	•				30	120
D3: Maintenance rule for tools and aux. equipments, periodic check		•				30	120
AVERAGE SCORE : 100							

Annex 2-(5). Evaluation Sheet

IMPACT OF THE PROJECT

Items of Impact	Present Condition	Evaluation				Rate	Score
		4	3	2	1		
1. Technical impacts for traceability system in Syria	The units of electric quantities are disseminated by NSCL through calibration services.	•				40	160
2. Technical impacts for the quality of measurements	The quality of measurements depends on the environment in which they are used, the procedure used, the training of the operator and the treatment of measurement data. The factors above guarantee the good measurements in NSCL.	•				25	100
3. Impacts for research work on measuring instruments	NSCL began research work and several standard instruments were developed. Conducting the research work is basis of international standards laboratory .	•				25	100
4. Economic impacts			•			10	30
AVERAGE SCORE: 98							

Annex 2-(6). Evaluation Sheet

SUSTAINABILITY OF NSCL

Items	Comments	Evaluation				Rate	Score
		4	3	2	1		
Organizational sustainability of NSCL	Organizational structure is adequate for the current scope of the Project. Needed manpower has been satisfactorily secured and no turnover ocurred	•				30	120
Financial sustainability of NSCL	Additional sources of foreign currency should be sought to sustain NSCL requirements.		•			30	90
Materials and technical sustainability of NSCL	It is necessary to continue the internal lectures and exchange of technical information with other organizations.	•				40	160
AVERAGE SCORE: 93							

Annex 3-1

List of Missions

1. First Mission Team (Oct.21 - Oct.29,1986)

Mr.Ryuichi Murata	Team Leader Deputy Manager,Technical Cooperation Division, Mining and Industrial Development Cooperation Department, JICA
Mr.Tokio Anzawa	Technical Cooperation Planning Inspector of electric equipment and material, Agency of Natural Resources and Energy (MITI)
Mr.Yoshio Ikeda	Measurement Standard Manager, Research Section,Technical Research Laboratory,JEMIC
Mr.Toshio Kato	Calibration System Manager,QC Planning Department,YOKOGAWA Electric
Mr.Takeo Eto	Design of Building Manager Overseas Department, YOKOGAWA Architects and Engineers Inc.

2. Second Mission Team (Sep.26, - Oct. 4,1987)

Mr.Shozo Kakuno	Team Leader Director,Mining and Industrial Development Cooperation Department, JICA
Mr.Ryuichi Murata	Deputy Leader Deputy Manager,Technical Cooperation Division, Mining and Industrial Development Cooperation Department, JICA
Mr.Akira Mogi	Technical Cooperation Planning Inspector of electric equipment and material, Agency of Natural Resources and Energy (MITI)
Mr.Yoshio Ikeda	Measurement Standard Manager, Research Section,Technical Research Laboratory,JEMIC
Mr.Toshio Kato	Calibration System Manager,QC Planning Department,YOKOGAWA Electric
Mr.Ryoichi Kibe	Design of Building Asst.Manager Overseas Department, YOKOGAWA Architects and Engineers Inc.

3. Third Mission Team (March 18, - March 26,1989)

Mr.Takeo Sakata	Team Leader Special Assistant to the Director, Mining and Industrial development Cooperation Department,JICA
Ms.Kyoko Nagashima	Technical Cooperation Planning Deputy Director,Electric Power Technology Div., Agency of Natural Resources and Energy (MITI)
Mr.Toshio Kato	Calibration System General Manager,Standards Laboratory Corporate QC Division, YOKOGAWA Electric
Mr.Yoshio Ikeda	Measurement Standard Manager, Research Section,Technical Research Laboratory,JEMIC
Mr.Satoru Takahashi	Coodinator Staff,Technical Cooperation Division, Mining and Industrial Development Cooperation Department, JICA

4. Fourth Mission Team (Feb.9 - Feb.17,1990)

Mr.Muneshige Yamazaki	Team Leader Director,Mining and Industrial Development Cooperation Department, JICA
Mr.Hideo Tachibana	Technical Cooperation Planning Inspector of electric equipment and material, Agency of Natural Resources and Energy (MITI)
Mr.Toshio Kato	Calibration System General Manager,Standards Laboratory Corporate QC Division, YOKOGAWA Electric
Mr.Yoshio Ikeda	Measurement Standard Manager,Technical Management Section,JEMIC
Mr.Satoru Takahashi	Coodinator Staff,Technical Cooperation Division, Mining and Industrial Development Cooperation Department, JICA

5. Fifth Mission (July 17 - July 24,1991)

Mr.Takahiko Kasama	Team Leader Deputy Director,Technical Cooperation Division, Mining and Industrial Development Cooperation Department, JICA
Mr.Hisao Nakamura	Management for Equipments Director, Technical Information Office,ETL
Mr.Shinya Arakawa	Technical Cooperation Planning Deputy Manager,Electric Power Technology Div., Agency of Natural Resources and Energy (MITI)
Mr.Yoshio Ikeda	Measurement Standard Manager,Technical Management Section,JEMIC
Mr.Tsuyoshi Murakami	Coodinator Mechanical Specialist, Technical Cooperation Division, Mining and Industrial Development Cooperation Department, JICA

6.Sixth Mission (July 23 - Aug. 2,1992)

Mr.Kozo Esaki	Team Leader Special Technical Advisor,JICA
Mr.Syunichiro Mita	Technical Cooperation Planning Deputy Manager,Electric Power Technology Div., Agency of Natural Resources and Energy (MITI)
Mr.Toshio Kato	Calibration System General Manager,Standards Laboratory Corporate QA Division, YOKOGAWA Electric
Mr.Yoshio Ikeda	Measurement Standard Director,Amagasaki Laboratory, JEMIC
Mr.Kazuhiko Tokuhashi	Coodinator Staff,Technical Cooperation Division, Mining and Industrial Development Cooperation Department, JICA

Annex 3-2

Dispatched Experts for NSCL Project

	NAME	BELONGING	SPECIALITY	DISPATCHED TERM
1	Mr.Yoshihiko Noguchi	YOKOGAWA	Standard Measurement	Sep.12,1988 ~ Sep. 11,1990
2	Mr.Hisao Nakamura	ETL	Chief Advisor	Nov.21,1988 ~ Nov.20,1989
3	Mr.Sadatoshi Minoyama	Okura Reiki	Air Conditioning System	Dec. 6,1988 ~ Fev. 6,1989
4	Mr.Setsuo Katayama	Shoshin	Shielded Room	Jan. 6,1989 ~ Fev. 3,1989
5	Mr.Takao Ohki	JEMIC	Install./Ope. for AC,DC,RC	Jan. 6,1989 ~ Apr.10,1989
6	Mr.Masahide Furukawa	YOKOGAWA	Install./Ope. for Temp.	Jan.13,1989 ~ Apr.10,1989
7	Mr.Yasuhiro Miyazawa	YOKOGAWA	Install./Ope. for RW Shop	Jan. 6,1989 ~ Apr.10,1989
8	Mr.Hideo Susuda	YOKOGAWA	Install./Ore. for RF	May 13,1989 ~ July 29,1989
9	Mr.Shigeaki Hatakeyama	JEMIC	Practical Cal.Work for DC,RC,AC	Sep.21,1989 ~ Dec.22,1989
10	Mr.Takahiro Nakase	ETL(Retired)	Chief Advisor	Nov. 8,1989 ~ Nov. 7,1990
11	Mr.Jinpei Kato	ANRITSU	Cal.of Measuring Instrument for RF	Nov.23,1989 ~ Dec. 7,1989
12	Mr.Shigeaki Hatakeyama	JEMIC	Install./Ope. for DC,RC,AC Primary Std	Jun. 2,1990 ~ July 1,1990
13	Mr.Shigeaki Hatakeyama	JEMIC	Standard Measurement	Jun.11,1991 ~ Oct. 2,1992
14	Mr.Masahiro Inoue	JEMIC	Practical Cal.Work for DC,RC Primary St	Jun.11,1991 ~ Oct.12,1991
15	Dr.Chikako Yamanouti	ETL(Retired)	Chief Advisor	July 9,1991 ~ Oct. 2,1992
16	Mr.Yoshitaka Sakumoto	JEMIC	Practical Cal.Work for AC,Pw/En Primary	Aug.20,1991 ~ Dec.21,1991
17	Mr.Yoshio Nakamura	SOKEN	Install./Ope. for WHM Testing Sys.	Aug.20,1991 ~ Sep. 6,1991

18	Mr.Mitsuhiro Sakurai	YOKOGAWA	Practical Repair Work	Sep.14,1991 ~ Dec.14,1991
19	Mr.Manabu Tashiro	YOKOGAWA	Practical Repair Work	Dec. 3,1991 ~ March 3,1992
20	Mr.Mutsumasa Inoue	JEMIC	Practical Cal.Work for AC,Pw/Eng.Primry	Apr.15,1992 ~ July 25,1992
21	Mr.Sadatoshi Minoyama	Okura Reiki	Air Condtioning System	July 17,1992~ Aug.16,1992
22	Mr.Masaaki Maeda	JMI	Practical Cal.Work for RF	July 31,1992~ Sep.29,1992
23	Mr.Jinpei Kato	ANRITSU	Practical Pepair Work for RF	Aug.31,1992~ Sep.22,1992

Annex 4

List of Equipments Provided by Japan

SSRC/NSCL-1 1/11

Nos.	Description of Goods	Specification, etc.		Q'ty
	Shipped from Japan :October, 1988.			
	Date of arrival at NSCL:November,1988.			
I.	DC Voltage / Current Secondary Standard and Calibration System			
1.	Digital Multimeters	2501A 23	YOKOGAWA	1set
2.	Shunt Resistor	2792 02/03/04/05/06	YOKOGAWA	1set
3.	Shunt Resistor with Cooling Fun	2743 04/05/06	YOKOGAWA	1set
4.	DC Calibration Sets	2550 01/REMC	YOKOGAWA	1set
5.	GP-IB converter	3466 11	YOKOGAWA	1set
6.	Standard Volt-Ratio Box	2748 00	YOKOGAWA	1set
7.	Vertical Pen Recorder	3056 22/REMC	YOKOGAWA	1set
8.	Electronic Galvanometer	2709 00	YOKOGAWA	1set
9.	DC Voltage Standard	731B	FLUKE	1set
10.	Selector Switch	2745 00	YOKOGAWA	1set
11.	Bench (for Calibration)		OKAMURA	1set
12.	AC Power stabilizer	SA2500Vb	YUTAKA	1set
13.	Uninterruptible Power Supply	UPS1010S	YUTAKA	1set
14.	Others			

Nos.	Description of Goods	Specification, etc.		Q'ty
II.	Resistance / Capacitance Secondary Standard and Calibration System			
II－1	Resistance			
1.	Standard Resistors	2792 01-10	YOKOGAWA	each.1s
2.	Standard Resistors	2792-90/S4	YOKOGAWA	1set
3.	Decade Resistance Box	2793 01 & 03	YOKOGAWA	each.2s
4.	Decade Resistance Box	DB-62	ESI	2sets
5.	Resistance Box	3947-90/S5	YOKOGAWA	1set
6.	Double Bridge	2752 00	YOKOGAWA	1set
7.	Electronic Galvanometer	2709 00	YOKOGAWA	1set
8.	DC Power Supply	PAD8-50L	KIKUSUI	1set
9.	Digital Multimeter	2501A 20	YOKOGAWA	1set
10.	DC Current Supply	2854 00	YOKOGAWA	1set
11.	Wheatstone Bridge	2768	YOKOGAWA	1set
12.	High impedance voltmeter /null detector.	845AB	FLUKE	1set
II－2	Capacitance			
1.	Standard Capacitor Set	16380A & C	YHP	each.1s
2.	Standard Capacitor Set	SM228C, 330D	SOSINN	each.1s
3.	Decade Type Variable Capacitor	4440B	YHP	2sets
4.	Digital LCR Meter	4274A, 16047B	YHP	1set
5.	Q Meter	4342A	YHP	1set
6.	Standard Inductor	16470A & B & C	YHP	each.1s
7.	Auxiliary capacitor Test adapter.	16462A & 16451A	YHP	each.1s
8.	High Resistance Meter	4329A	YHP	1set
9.	AC Power Stabilizer	SA2500S	YUTAKA	1set
10.	Uninterruptible Power Supply	UPS1010-7	YUTAKA	1set
11.	Benches.		OKAMURA	1set

Nos.	Description of Goods	Specification, etc.		Q'ty
Ⅲ.	Temperature Primary / Secondary Standards and Calibration System			
Ⅲ-1	Primary Standards			
1.	Standard Platinum Resistance Thermo-bulb.	R800-1F1	CHINO	3sets
2.	Standard Thermo Couple	C800-15F3	CHINO	3sets
3.	0℃ reference junction bath.	ZC114/ZA-10	KOMATSU	1set
4.	DC digital voltmeters	1281	DATRON	2sets
5.	Standard Resistor	2792 03～06 (0.1/1/10/100Ω)	YOKOGAWA	each.1s
6.	Standard Resistor	2792 90 (25/50 Ω)	YOKOGAWA	each.1s
7.	DigitaL Resistance Thermometer.	2804	YOKOGAWA	1set
8.	DC Current Supply	2854 00	YOKOGAWA	1set
9.	Disk top Computer set	M3220A-E20B (YEWMAC-50)	YOKOGAWA	1set
10.	DC Voltage standard	731B	FLUKE	1set
11.	Vertical Pen Recorder	3052 22	YOKOGAWA	1set
12.	Selector Switch	2745 00	YOKOGAWA	1set
13.	Ice-point bath	Dewar Jar	TOKAIRIKA	2sets
14.	Oil Bath	TPU-O-21	OKAZAKI	1set
15.	Salt Bath	TPU-N-21	OKAZAKI	1set
16.	Thermocouple comparison furnace & Controller	TPU-SCF-21	OKAZAKI	1set
17.	Ice maker & Crusher	IM-35 & ISR-2	HOSHIZAKI	each.1s
18.	Water deionizer		ORGANO	1set
19.	Benches		OKAMURA	1set
20.	AC Power Stabilizer	SA 2500S	YUTAKA	1set
21.	Uninterruptible Power Supply.	UPS1010	YUTAKA	1set
22.	Others			

Nos.	Description of Goods	Specification, etc.		Q'ty
Ⅲ.	Temperature Primary / Secondary Standards and Calibration System			
Ⅲ-2	Secondary Standards			
1.	Working standard(Pt RTD)	RS-16-43NNN-HB	OKAZAKI	5sets
2.	Working thermocouple	Type R,K,E,J,T	OKAZAKI	each.5s
3.	Ice point bath	ZC114/ZA-10	KOMATSU	1set
4.	Compensation leadwire	Type R	OKAZAKI	10m
5.	Compensation leadwire	Type K,E,J,T	OKAZAKI	each100m
6.	Hybrid Recorder	3081 27/GPIB	YOKOGAWA	1set
7.	Reference thermometer	-50～360℃ 8pc.	TOA	1set
8.	Mercury-in-glass thermometer	-20～50,-5 ～105 ℃ 0～250 ℃	TOA	each.3s
9.	Portable Digital Thermometer.(thermocouple)	2455 04, 2459 01 & 03	YOKOGAWA	each.1s
10.	Pump for Liquid Transfer	MH-21	STEPSCIENCE	3sets
11.	Tools & Leadwire			1set
12.	Others			

Nos.	Description of Goods	Specification, etc.		Q'ty
IV.	AC Voltage / Current Secondary Standard and Calibration System			
1.	AC Voltage Standard	4200A	DATRON	1set
2.	Digital Voltmeter	1281	DATRON	1set
3.	AC Voltage Current Standard	2558 01	YOKOGAWA	1set
4.	AC Large Current Regulator	CCU-1000	KEIHIN DENS	1set
5.	Frequency Counter	5316B	HP	1set
6.	Digital AC Power Meter	2503 23	YOKOGAWA	1set
7.	Potential Transformer	2261 & 2262	YOKOGAWA	each.2s
8.	Current Transformer	2243	YOKOGAWA	1set
9.	Current transformer	B9403FY	YOKOGAWA	1set
10.	Distortion Meter	339A	YHP	1set
11.	Oscilloscope	3364	YOKOGAWA	1set
12.	Vertical Pen Recorder	3056 22	YOKOGAWA	1set
13.	AC TRANSDUCERS	2383-21,22, -24,26	YOKOGAWA	each.1s
14.	Benches		OKAMURA	1set
15.	AC Power Stabilizer	SA2500S	YUTAKA	1set
16.	Uninterruptible Power Supply	UPS2510VB	YUTAKA	1set
17.	Tools & Leadwires			1set
18.	Others			

Nos.	Description of Goods	Specification, etc.		Q'ty
VI.	Radio-Frequency Power / Attenuation Standard and Calibration System			
	Shielded Room			
1.	Shielded Room		RAYPROOF	1set
2.	Power Source Filter	AC220V 60A	RAYPROOF	1set
3.	Telephone/filter.		RAYPROOF	1set
4.	Measurement Connector-Panel(set up Panel)		RAYPROOF	1set
5.	Air duct		RAYPROOF	5sets
6.	Power Transformer (insulated & Shieled)	AC220V 50HZ/10KVA	TOKYOSEIDEN	1set
7.	Assembling & Wiring.			1set
8.	Tool sets		HOZAN etc	1set
9.	Interphone			1set
10.	Benches		OKAMURA	1set
11.	Air conditioner.		HITACHI	1set

Nos.	Description of Goods	Specification, etc.		Q'ty
Ⅶ	Multimeter and Recorder Repair Bench (Tertiary Standard and Calibration System)			
1.	Oscilloscope	3664 00	YOKOGAWA	2sets
2.	High Impedance Probe	3669 11	YOKOGAWA	8sets
3.	Digital Multimeter	2502A 11	YOKOGAWA	2sets
4.	Selector switch	2745 00	YOKOGAWA	2sets
5.	Portable DC A & V meters	2012 00	YOKOGAWA	2sets
6.	Portable AC A & V meters	2013 05,06,07 08,18,19	YOKOGAWA	each.1s
7.	Current Transformer	2244 00	YOKOGAWA	1set
8.	Portable Wheatstone Bridge	2755 97	YOKOGAWA	1set
9.	Logic Analyzer	SL-4121,SL-027	IWASAKI	1set
10.	DC Calibration set	2550 01	YOKOGAWA	1set
11.	Volt-Ratio Box	2744 00	YOKOGAWA	1set
12.	AC Volt/Current Standard	2558 01	YOKOGAWA	1set
13.	Function Generator	3314A OPT001	YHP	1set
14.	Standard Resistors	2792 01～10	YOKOGAWA	each.1s
15.	Decade Resistance Boxes	2793 01,03	YOKOGAWA	each.2s
16.	Decade Resistance Box	2786 10	YOKOGAWA	2sets
17.	Decade Resistance Box	DB-62	ESI	2sets
18.	Megohm Resistance Box	3947 90/S5	YOKOGAWA	1set
19.	Dimentional Measuring Tools	Calipers,Gages	MITUTOYO,etc.	each.1s
20.	Withstanding Voltage Tester	871,HTP-1.5A	KIKUSUI	each.1s
21.	Insulation/Leakage Testers	2403,3226	YOKOGAWA	each.1s
22.	Milliohm Meter	4328A	YHP	1set
23.	AC Voltage Regulator	SAT-2005	TOKYOSEIDEN	2set
24.	DC Power Supplies	PAR-160A,80Aetc	KIKUSUI	each.2s
25.	Reference Junction Bath	ZC-114	KOMATSU	1set
26.	Ice Point Bath,etc		TOKAIRIKA	2set
27.	Ice Meker & Ice Crusher	IM-35J,ISR-2	HOSIZAKI	each.1s
28.	Temperature & Humidity Test Chamber	PL-3GT	TABAIESPEC	1set
29.	Temperature & Humidity Recorder	3081,2577,etc	YOKOGAWA	1set
30.	AC Voltage Stabilizer	SA2500S	YUTAKA	1set
31.	Uninterruptible Power Suuply	UPS1010-7	YUTAKA	1set

Nos.	Description of Goods	Specification, etc.		Q'ty
Ⅶ	Multimeter and Recorder Repair Bench (Tertiary Standard and Calibration System)			
32.	Soldering Iron	H926M	HAKKO	4sets
33.	Tool sets (Box type)	S-82	HOZAN	4sets
34.	Circuit Tester	3201 10	YOKOGAWA	4sets
35.	Electrostatic eliminators, Conductive Floor mat, Ionizer			each. 4s
36.	Desolder for circuit board	MS-2210F	MEISYO	4sets
37.	Compact hand drill	Mini type	STEP SCIENCE	4sets
38.	Circuit board holder & magnifier	H91 & 93	HOZAN	each. 4s
39.	Compact refrigerator (for storing bonding agent & Silicone rubber)	GR187EX(G) 148L		1set
40.	Benches	Side Bench, Calibration bench etc	OKAMURA	1set
41.	Lead wires for calibration			1set
42.	Vinyl covered wires & cable, plug etc	Twisted wires Power Cables		1set
43.	Auxiliary Material	Solder, Contact clamping tool, screws, nuts etc		1set
44.	Basic electronic parts	Resistor, Capacitor, Diode etc		1set
45.	Others			

Nos.	Description of Goods	Specification, etc.		Q'ty
Ⅷ.	DC Power Supply and DC Voltage Standard Repair Bench (Tertiary Standards and Calibration System)			
1.	Oscilloscope	DS6411	IWASAKI	2sets
2.	Probe(High impedance type)	SS-0012R	IWASAKI	8sets
3.	Probe(Current type)	CP502&512&522	IWASAKI	each.1s
4.	Probe(High voltage type)	HV-P30	IWASAKI	1set
5.	Digital Multimeter	2502A 21	YOKOGAWA	2sets
6.	Selector switch	2745 00	YOKOGAWA	2sets
7.	Portable DC A&V meter	2012 00	YOKOGAWA	2sets
8.	Portable AC A&V meter	2013 05～08, 18,19	YOKOGAWA	each.2s
9.	Current Transformer	2244 00	YOKOGAWA	2sets
10.	Digital AC Power meter	2503 23	YOKOGAWA	1set
11.	Vertical Pen Recorder	3056 22/REMC	YOKOGAWA	1set
12.	AC Cur./Volt. Transducers	2383 21, 22, 24, 26	YOKOGAWA	each.1s
13.	Frequency Transducer	2388 21	YOKOGAWA	1set
14.	Standard Resistors	2792 02～06	YOKOGAWA	each.1s
15.	Standard Shunt	2743 03～06	YOKOGAWA	each.1s
16.	Volt-Ratio Box	2744 00	YOKOGAWA	1set
17.	Digital L.C.R.Meter	4261A	YHP	1set
18.	Portable Double Bridge	2769 10	YOKOGAWA	1set
19.	DC Calibration set	2560 43	YOKOGAWA	1set
20.	Electronic load	PLZ 152	KIKUSUI	1set
21.	Electronic load	PLZ 72	KIKUSUI	1set
22.	Slide Resistors	2791 01～03, 05 08, 10, 12	YOKOGAWA	each.2s
23.	Decade Resistance Boxe	2793 01, 2786 01	YOKOGAWA	each.2s
24.	Withstanding Voltage/ Insulation Tester	871, HTL-3W HTP-1.5	KIKUSUI	each.1s
25.	Insulation Tester	2403 02 & 03	YOKOGAWA	each.1s
26.	Leakage Current Tester	3226 10, 3227	YOKOGAWA	each.1s
27.	Voltage Regulator	SAT-2005	TOKYO SEIDEN	2sets
28.	Regulated DC Power Supply	PAR-160A	KIKUSUI	4sets
29.	Regulated DC Power Supplies	PAR-80, PAB18-2.5DU	"	each.2s
30.	Digital Thermometer	2455 04	YOKOGAWA	1set
31.	Digital infrared Thermometer	2583 00	YOKOGAWA	1set

Nos.	Description of Goods	Specification, etc.		Q'ty
Ⅷ.	DC Power Supply and DC Voltage Standard Repair Bench (Tertiary Standards and Calibration System)			
32.	AC Power Supply Stabilyzer	SA2500S	YUTAKA	1set
33.	Uninterruptible Power Supply	UPS1010S	YUTAKA	1set
34.	Soldering irons	926M, etc	HAKKO	4set
35.	Tool set(Box type)	S82	HOZAN	1set
36.	Circuit Tester	3201 19	YOKOGAWA	4set
37.	Electrostatic eliminators, Conductive Floor mat, Ionizer			each. 4s
38.	Desolder for circuit board	MS-2210F	MEISYO	4sets
39.	Compact hand drill	Mini type	STEP SCIENCE	4sets
40.	Circuit board holder & magnifier.	H91 & 93	HOZAN	each. 4s
41.	Benches	Side Bench, Calibration bench etc	OKAMURA	1set
42.	Lead wires for calibration			1set
43.	Vinyl covered wires & cable, plug etc	Twisted wires Power Cables		1set
44.	Auxiliary Material	Solder, Contact clamping tool, screws, nuts etc		1set
45.	Others			

Nos.	Description of Goods	Specification, etc.		Q'ty
XII.	Air conditioning system. (Constant Temperature Air Conditioning for Standard Calibration Room. A, B, C, D, E, F room)			6rooms
1.	Air conditioning Unit	Separate type	HITACHI	7sets
2.	Humidifier		OUKURA	7sets
3.	Electric fan	Wall type	HITACHI	13sets
4.	Ventilation fan	Exhaust	HITACHI	1set
5.	Ventilation fan	In take	HITACHI	7sets
6.	Wall for air circulation		OUKURA	2sets
7.	Control Panel (temperature & humidity Controller)		OUKURA	6sets
8.	Temperature & Humidity Recorder Panel		OUKURA	1set
9.	Spare Units		HITACHI	7sets
10.	Others			

SSRC/NSCL-2

Nos.	Description of Goods	Specification, etc.	Q'ty

Shipped from Japan :March,1989
Date of arrival at NSCL:May, 1989

VI-1 Radio-Frequency Power / Attenuation / Impedance Secondary Standard and Calibration System

VI-1 (1) Attenuation / Impedance

1.	ATTENUATOR	MP721, ANRITSU	24
2.	COAXIAL & STEP ATTENUATOR	8494, etc.,YHP	6
3.	NETWORK SPECTRUM ANALYZER	MS620J, etc., ANRITSU	1set
4.	TEST PORT CONNECTOR	22N50,etc., WILTRON	18
5.	OTHERS		

VI-1 (2) Radio-Frequency Power

1.	POWER METER	ML4803,etc,ANRITSU	7
2.	POWER SENSOR	MA4702A,etc,ANRITSU	3
3.	ELECTRONIC VOLTMETER	ML69A,etc,ANRITSU	6
4.	OTHERS		

VI-2 Frequency Calibration System

1.	RUBIDIUM FREQUENCY STANDARD	NEATOMIC,etc,NEC	3
2.	FREQUENCY CONVERTER	XSRM-Z, ROHDE&SCHWARZ	1
3.	PHASE COMPARATOR	XSRM-Z3, ROHDE&SCHWARZ	1
4.	CRYSTAL OSCILLATOR	XSD2,etc ROHDE&SCHWARZ	1
5.	SYNTHESIZER SIGNAL GENERATOR	MG655A,etc,ANRITSU	1
6.	FREQUENCY COUNTER	MF63A ANRITSU	1
7.	SYNTHESIZER/LEVEL GENERATOR	MG443B,ANRITSU	1
8.	DIGITAL MULTIMETER	2503A23, YOKOGAWA	1
9.	OSCILLOSCOPE	2235 SONY-TEKTRONIX	1
10.	TOOL SET	S-82, HOUZAN	1SET
11.	AC VOLTAGE REGURATOR	SA-2500S,etc,YUTAKADENKI	1SET
12.	OTHERS		

S S R C / N S C L − 2

Nos.	Description of Goods	Specification, etc.	Q'ty
IX.	Oscilloscope Repair Bench		
1.	PROGRAMMABLE CALIBRATION GENERATOR	CG5001, etc SONY-TEKTRONIX	1SET
2.	ATTENUATOR	011-0069, SONY-TEKTRONIX	15
3.	FEED-THROUGH TERMINATION	011-0049, SONY-TEKTRONIX	5
4.	OSCILLOSCOPE WITH CURRENT PROBE	2235, etc, SONY-TEKTRONIX A6302, A503	1SET
5.	DIGITAL MULTIMETER	2502A23, YOKOGAWA	1
6.	SYNTHESIZER/LEVEL GENERATOR	MG443B, ANRITSU	1
7.	FREQUENCY COUNTER	MF63A, ANRITSU	1SET
8.	WITHSTANDING VOLTAGE TESTER	871, etc, KIKUSUI	1SET
9.	INSULATION TESTER, ETC	2403, etc YOKOGAWA	2
10.	VOLTAGE REGULATOR	SAT-2005, TOKYO SEIDEN	1SET
11.	OSCILLOSCOPE TRAINING EQUIPMENT	ITF-04, IWASAKI	1SET
12.	TOOL SET	3000-01, HOUZAN	1SET
13.	CABLE, CONNECTOR, ADAPTER	HP, ANRITSU	1SET
14.	AC VOLTAGE REGURATOR	SA2500S, YUTAKA	1
15.	UNINTERRUPTIBLE POWER SUPPLY	UPS101-7, YUTAKA	1
16.	HIGH VOLTAGE TESTER	3000-01, 9017	1SET
17.	DC POWER SUPPLY	PAB18-2.5DU, etc	4
18.	TOOLS, WIRE, CABLE		
19.	OTHERS		

S S R C／N S C L－2

Nos.	Description of Goods	Specification, etc.	Q'ty
X.	Signal Generator Repair Bench		
1.	SPECTRUM ANALYZER	MS611A, etc, ANRITSU	1SET
2.	MODULATION ANALYZER	MS616A ANRITSU	1SET
3.	OSCILLOSCOPE	2235 SONY-TEK.	1SET
4.	FREQUENCY COUNTER	MF63 ANRITSU	1
5.	POWER METER	ML4803A, MA4601A, MA4702A ANRITSU	1SET
6.	FIXED ATTENUATOR	MP721A～H ANRITSU	3SET
7.	PROGRAMMABLE ATT.	MN63A	2SET
8.	TERMINATION	MP752A, 752B	10EACH
9.	ELECTRONIC VOLTMETER	ML69A ANRITSU	1
10.	DISTORTION METER	339A Y-HP	1
11.	DIGITAL MULTIMETER	2502A YOKOGAWA	1
12.	SELECTIVE LEVEL METER	ML422A ANRITSU	1
13.	REFLECTION BRIDGE	MR63J ANRITSU	1
14.	SIGNAL GENERATOR	MG3601A, etc, ANRITSU	1SET
15.	SYNTHESIZER/ LEVEL GENERATOR	MG443B ANRITSU	1
16.	PERSONAL TECHNICAL COMPUTER	MC1202A, etc, ANRITSU	1SET
17.	X-Y PLOTTER	MP3200-11 ANRITSU	1
18.	REGULATED DC POWER SUPPLY	PAB, KIKUSUI	4
19.	AC POWER SUPPLY	1EA-2000A NF	1
20.	LOGIC ANALYZER	SL, IWATSU	1
21.	WITHSTANDING VOLTAGE TESTER	871, KIKUSUI	1
22.	INSULATION TESTER	2403, etc, YOKOGAWA	8
23.	ELECTRONIC CIRCUIT TRAINING SIMULATOR	ITF, etc, IWATSU	2
24.	AC STABILIZER	SA-2500S YUTAKA	1
25.	UNINTERRUPTIBLE POWER SUPPLY	4PS-1010-7YUTAKA	1
26.	TOOL SET	HOUZAN, HAKKO KINZOKU	1SET
27.	CABLE, CONNECTOR, ADAPTER	HP, ANRITSU	1SET
28.	OTHERS		

Nos.	Description of Goods	Specification, etc.		Q'ty
	Shipped from Japan :March,1990 Date of arrival at NSCL:May, 1990			
I.	DC Voltage / Current Primary Standard and Calibration System			
1.	Standard Cell Air Bath	2748	YOKOGAWA	1set
2.	DC Voltage Reference Standard	732A	FLUKE	1set
3.	Potentiometer	9930	GUILDLINE	1set
4.	Standard Voltage Divider	2746	YOKOGAWA	1set
5.	DC Voltage Standard	4000A	DATRON	1set
6.	Digital Voltmeter	1281	DATRON	1set
7.	TOOL, etc.	S82	HOZAN	1set
8.	AC Voltage Stabilizer	SA2500S	YUTAKA	1set
9.	Uninterruptive Power Supply	UPS1010-7	YUTAKA	1set
10.	Calibration Bench,Cart		OKAMURA	1set
11.	Others			
II.	Resistance / Capacitance Primary Standard and Calibration System			
1.	Standard Resistor	2781 04,2792	YOKOGAWA	16
2.	Build-Up Resistor	3947	YOKOGAWA	1set
3.	Decade Resistance Box	DB62-4	ESI	1set
4.	Decade Resistor(4terminals)	RS925D	ESI	1set
5.	Standard Capacitor	1404A,B/16380A,C	GENRAD/YHP	each.1s
6.	Capacitance Measuring System	1620-AP	GENRAD	1set
7.	Tool, Leads,Cables		HOZAN,etc	1set
8.	AC Voltage Stabilizer	SA2500S	YUTAKA	1set
9.	Uninterruptive Power Supply	UPS1010-7	YUTAKA	1set
10.	Calibration Bench,Cart		OKAMURA	1set
11.	Others			

Nos.	Description of Goods	Specification, etc.		Q'ty
II.	Resistance / Capacitance Primary Standard and Calibration System			
1.	Resistanc Bridge	9975, etc	GUILDLINE	1set
2.	Recorder	3056	YOKOGAWA	1set
3.	Standard Resistor	2794 03, 04, 05, 06 2792 07	YOKOGAWA	each. 1s
4.	Switch Box	4terminals 10point	YOKOGAWA	1set
5.	Oil Bath	9732VT	GUILDLINE	1set
6.	Liquid Paraffin	Crystol 70	ESSO	15kgx8
7.	Others			

Nos.	Description of Goods	Specification, etc.		Q'ty
Ⅲ.	AC Voltage / Current Primary Standard and Calibration System			
1.	AC-DC Transfer Standard	1605B	BALANTAINE	1set
2.	Active Shunt, Transfer Ass'y	1625A, 16053A	BALANTAINE	each. 1s
3.	DC Calibration Set	2550	YOKOGAWA	1set
4.	AC Voltage standard	4200A	DATRON	1set
5.	Digital Voltmeter	1281	DATRON	1set
6.	Decade Inductive Divider	DT72A	ESI	1set
7.	Frequency Counter	5316B	YHP	1set
8.	Oscilloscope	3664	YOKOGAWA	1set
9.	Tool, Lead wires	S82, etc.	HOZAN, etc	1set
10.	AC Voltage Stabilizer	SA2500S	YUTAKA	1set
11.	Uninterruptive Power Supply	UPS2510S	YUTAKA	1set
12.	Calibration Bench, Cart		OKAMURA	1set
13.	Others			

Nos.	Description of Goods	Specification, etc.		Q'ty
	Shipped from Japan :March,1990 Date of arrival at NSCL:May, 1990			
V.	AC Power/Energy Standard and Calibration System			
V-1	AC Power Standard and Calibration System			
1.	Standard Watt Converter	2885 20-S2	YOKOGAWA	1set
2.	AC Voltage Current Standard	2558	YOKOGAWA	2set
3.	Low Distrotion Oscillator	AG15	SHIBASOKU	1set
4.	Phase Shifter	3862	YOKOGAWA	1set
5.	Standard Potential Transformer	PTP-66G,-34,etc	KEIHINDENSOK	4set
6.	Current Comparator	4761	TETTEX	2set
7.	Digital Voltmeter	2502A 23	YOKOGAWA	2set
8.	Digital Powermeter	2533 13	YOKOGAWA	1set
9.	V/F Converter	B9822CA	YOKOGAWA	2set
10.	Computer,Printer	M3220(YEWMAC),etc	YOKOGAWA	1set
11.	Tool-Set, Cable	S-85,etc	HOZAN,etc	1set
12.	Terminal box	B9882DA	YOKOGAWA	1set
13.	Portable Wattmeters	2042 01,02,03	YOKOGAWA	each.1s
14.	Withstanding Voltage/ Insulation Tester	871,HTL-3W HTP-1.5A	KIKUSUI	1set
15.	Insulation Tester	2403 02,2404 15	YOKOGAWA	each.1s
16.	AC Voltage Stabilizer	SA2500S	YUTAKA	1set
17.	Uninterruptible Power Supply	UPS2510S	YUTAKA	1set
18.	Bench,Desks,Rack	NONE	OKAMURA	1set
19.	Others			

Nos.	Description of Goods	Specification, etc.		Q'ty
V-2	Watt-hour Meter Calibration System			
1.	Watt-hour Meter Calibration System	DAC-301-EX	SOKEN	1SET
2.	Standard Electric Watt-hour Meter	OE4AH-I	OHOSAKI	2set
3.	RC Counter	NONE	SOKEN	2set
4.	Current Transformer Testing Set	DAC-CTT-3EX DAC-SCT-1, TG-12	SOKEN	1set
5.	Rack	NONE		1set
6.	Clamp Ammeter	CL-615	YOKOGAWA	2set
7.	Oscilloscope	3665	YOKOGAWA	1set
8.	Universal Counter	5316B	HP	1set
9.	Insulation tester	2403 02	YOKOGAWA	2set
10.	Digital Multimeter	2502A23	YOKOGAWA	1set
11.	AC Ammeters	2013 14, 03	YOKOGAWA	each. 2s
12.	Watt-hour meters	A11, A31, OQ09, OQ09G	OOSAKI	each. 3s
13.	AC Voltage Regulator	S-210	KEIHIN	2set
14.	Stepdown Transformer	DAC-SDT	SOKEN	1set
15.	Standard Current Transformer	CTS-1019	KEIHIN	1set
16.	Tool Set	S-85	HOZAN	2set
17.	Cables	WHS1～31, WH-1～4	SOKEN	1set
18.	AC Voltage Stabilizer	SA2500S	YUTAKA	1set
19.	Bench for Calibration, Desk		OKAMURA	1set

Nos.	Description of Goods	Specification, etc.		Q'ty
V-3	Mechanical Workbench			
1.	Hand Cutter	PC300	SANHATOYA	1set
2.	Hand Brake	K-130		1set
3.	Electro-Hydraulic Press	GP-1	LEAD	1set
4.	Bench-top Drilling Machine	B-13	SAKAE	1set
5.	Drilling Machine Stand	SB-2	SAKAE	1set
6.	Elecrtric Hand Drill	DG-6	YUTAKA	1set
7.	Bench Grinder	GT21	YUTAKA	1set
8.	Working Table	KW-302V	SAKAE	1set
9.	Bench Lathe	L-1000, KTB-493	COSMO	1set
10.	Surface Plate	none	YUTAKA	1set
11.	Angle Plate	none	YUTAKA	1set
12.	V Block	none	YUTAKA	1set
13.	Digital Height Gauge		MITUTOYO	1set
14.	Prarell Vise	none	YUTAKA	1set
15.	Hand Taps/Hap Wrench	None	YUTAKA	1set
16.	Tool Cabinet/Tool Set	NTS-503		1set
17.	Electric Vacuum Cleaner	50V-101A	SUIDEN	3set
18.	Air Compressor(Beby type)			1set
19.	Others			

Nos.	Description of Goods	Specification, etc.	Q'ty

Shipped from Japan :March,1991
Date of arrival at NSCL:July, 1991

TRANSFER STANDARDS

1.	DC Reference Standard	732A,etc, FLUKE	1
2.	Standard Resistor	2794, YOKOGAWA	4
3.	Reference Standard Capacitor	1404A, GENRAD	2
4.	Standard Thermocouple	C800 CHINO	2
5.	Standard Resistance Bulb	R800 CHINO	2
6.	DC-AC Transfer Standard	540B,FLUKE	1
7.	Current Shunt	A40, FLUKE	16
8.	Digital Power Meter	2533-23, YOKOGAWA	1
9.	RF Power Meter	ML4803A, ANRITSU	1
10.	Power Sensor	MA4601A, ANRITSU	2
11.	Attenuator	MP721, ANRITSU	12
12.	Termination	MP752, ANRITSU	6
13.	Rubidium Frequency Standard	RB-1008C, NEC	1
14.	OTHERS		

Nos.	Description of Goods	Specification, etc.		Q'ty

Shipped from Japan :September,1992
Date of arrival at NSCL:September,1992

Spare Parts

1.	DIODE	A1059HL	YOKOGAWA	15
2.	TRANSISTOR	A1150HQ,others	YOKOGAWA	280
3.	PHOTOCOUPLER	A1014PC,others	YOKOGAWA	34
4.	ANALOGUE IC	A1272LA,others	YOKOGAWA	109
5.	REGURATOR IC	A1021LR,others	YOKOGAWA	111
6.	RELAY	A1175MR,others	YOKOGAWA	133
7.	TTL(LS)	A1328LS,others	YOKOGAWA	1070
8.	4000A SPARE KIT		DATRON	1set
9.	4200A SPARE KIT		DATRON	1set
10.	4000/4200 EXTENDER CARDS		DATRON	1set
11.	1281/71 SPARE PERTS		DATRON	1set
12.	MG CONTACTOR	H20	OUKURA	5
13.	MG CONTACTOR	H8C	OUKURA	5
14.	TIMER	H2A-H/30s	OUKURA	5
15.	TIMER	H2A-H/30min	OUKURA	5
16.	MICRO RELAY	MY-2N	OUKURA	5
17.	MICRO RELAY	MY-4N	OUKURA	5
18.	SOLID STATE RELAY	G3PA-220B	OUKURA	5
19.	75 OHM SET	MA610A	ANRITSU	1
20.	UNBALANCED IMPEDANCE	MH683A	ANRITSU	1
21.	OTHERS			

In addition,following machinery/equipment are procurred and provided by JICA in Syria. in the course of implementation of the Project.

1.	Moter Vehicle		Volvo	1
2.	Copy Machine	1025	Xerox	1
3.	Stabilized Electric	BP204A (255kVA)	Petbow	
	Generator system	TS888X,HP2033	Claude Lyons	1set
4.	Standard Freqency Reciever	XKE2	Rohde Shwarz	1set

Annex 5

List of Counterpart Trained in Japan

Groupe No.	Name	Training field	Date
	(First Group)		
1	Dr. M. Aghbar	Standard Measurement	March 22, 1988 ~ Dec. 14, 1992
2	Mr. A. Karouni	DC, RC	March 22, 1988 ~ Jun. 13. 1988
3	Mr. M. Zaawite	AC, Power/Energy	=
4	Mr. M. Harb	Temperature	=
	(Second Group)		
5	Mr. T. Haji	Oscilloscope	Jan. 20, 1989 ~ Apr. 23, 1989
6	Mr. M. Kashour	Signal Generator	=
7	Mr. S. Hassan	Radio Frequency	=
	(Third Group)		
8	Mr. M. Jumaa	AC, Power/Energy	March 6,1990 ~ Jun. 3, 1990
9	Mr. W. Saadi	DC	=
10	Mr. E. Salhani	RC	=
11	Mr. N. Elias	Repair	=
	(Fourth Group)		
12	Mr. M. Haj Ibrahim	Radio Frequency	March 26, 1991 ~ Jun. 30, 1991
13	Mr. R. Ibrahim	Repair	=
14	Mr. K. Barakat	Power/Energy	=
15	Mr. M. Hafiry	RC	=
	(Fifth Group)		
16	Dr. M. Kubeitari	Research, Management	March 7, 1992 ~ Jun. 8, 1992
17	Mr. B. Makkieh	RF Repair	March 25, 1992 ~ July 5, 1992
18	Mr. B. A. Adas	RF Calibration	=
19	Mr. G. Sharani	Power/Energy	=

Annex 6-1

List of NSCL staff in 1988

Name	Age	Univ. or Inst.	Main Subject (Career)	Present Work	Trainee	Expert
Mr. S. Waiss	57	Damascus, Mosco	Math, Phys, Chem, Geo, Mech	Diredctor	87.6-6	Nak.Nog.
Mr. M. Nokary	45	Belegrad Univ.	Electrical; Construct. Dep.	Vice director		
Dr. M. Aghbar	37	Canam Univ.	Metrology; Systems	Division chief	88.3-12	Nak.Nog.
Mr. M. Zaawite	35	Damascus, Cairo	Electronic; Calibration + QC	Sec. ch. (AC)®®	88.3-6	Ohki
Mr. Z. Batter	34	Leningrad Univ.	Electronic; QC + Maintenance	Sec. ch. (RF)®®		
Mr. R. Ebrahim	32	Aleppo Univ.	Electronic; Test Equip.	Sec.ch(Rep.)®®		Miyazawa
Mr. M. Harb	29	Damascus Univ.	Electrical; Solar system	Sec.ch.(Temp.)®	88.3-6	Furukawa
Mr. A. Karuouni	38	Damascus Inst.	Electronic; Test & Calib. Dep	Sec.ch.(DC)®®	88.3-6	Ohki
Mr. T. Haji	31	Damascus Inst.	Electronic; Test & Calib.Dep	RF ®®	89.1-4	
Mr. M. Kashour	32	Damascus Inst.	Electronic; Test & Calib.Dep	RF ®®	89.1-4	
Mr. S. Hassan	31	Damascus Inst.	Electronic; Test & Calib.Dep	RF ®®	89.1-4	
Mr. W. Saadi	25	Damascus Inst.	Electronic; Test & Calib.Dep	DC ®®		Ohki
Mr. M. Hafiry	23	Damascus Inst.	Electronic; Test & Calib.Dep	Repair ®®		Miyazawa
Mr. M. Jumaa	28	Damascus Inst.	Electronic; Test & Calib.Dep	AC ®®		Ohki
Mr. N. Alias	29	Damascus Inst.	Electronic; Test & Calib.Dep	Repair ®®		Ohki
Mr. K. Barakat	23	Damascus Inst.	Electronic; Test & Calib.Dep	Repair ®®		Ohki
Mr. S. Akrami	22	Damascus. Inst.	Mechanical (Air-Condi.)	Temperature®®		Furakawa
Mr. K. Saadi	23	Damascus Inst.	Electrical	Repair ®®		Miyazawa
Mr. S. Tateesh	24	Damascus Univ.	Electrical	Repair ®®		Miyazawa
Mr. M. Z. Swed	20	Damascus Inst.	Electrical	Repair ®®		Miyazawa

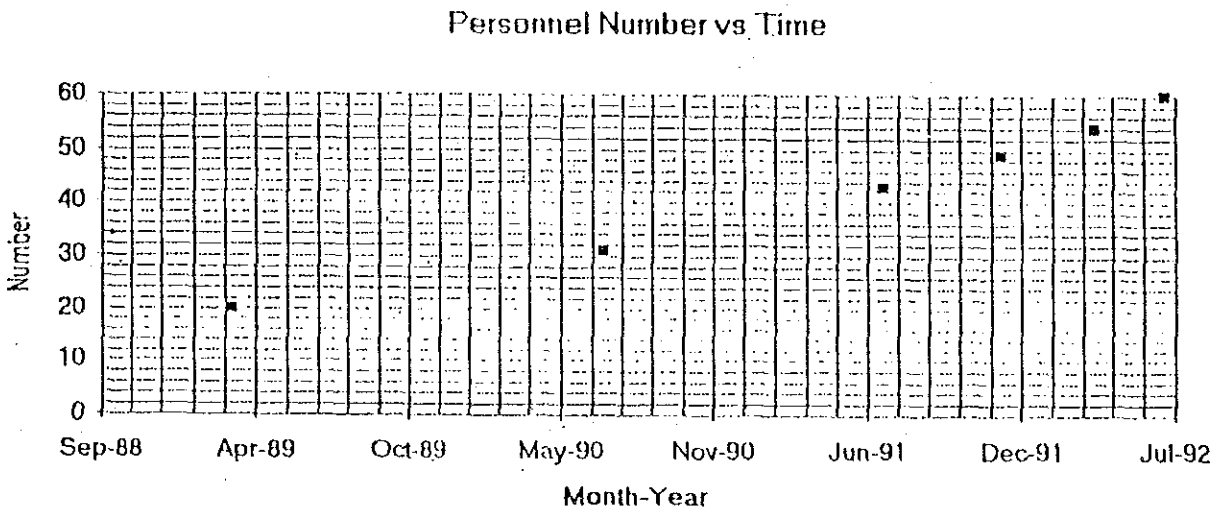
Notes: ®.DC voltage and current, ®. Resistance and capacitance, ®. Temperature,
®.AC voltage and current, ®. Electric power and energy, ®. RF power and attenuation,
®. Frequency, ®. Mutimeters and recorders, ®. Power supplies,
®. Oscilloscope, ®. Signal generator

Annex 6-2

List of NSCL Staff in 1992

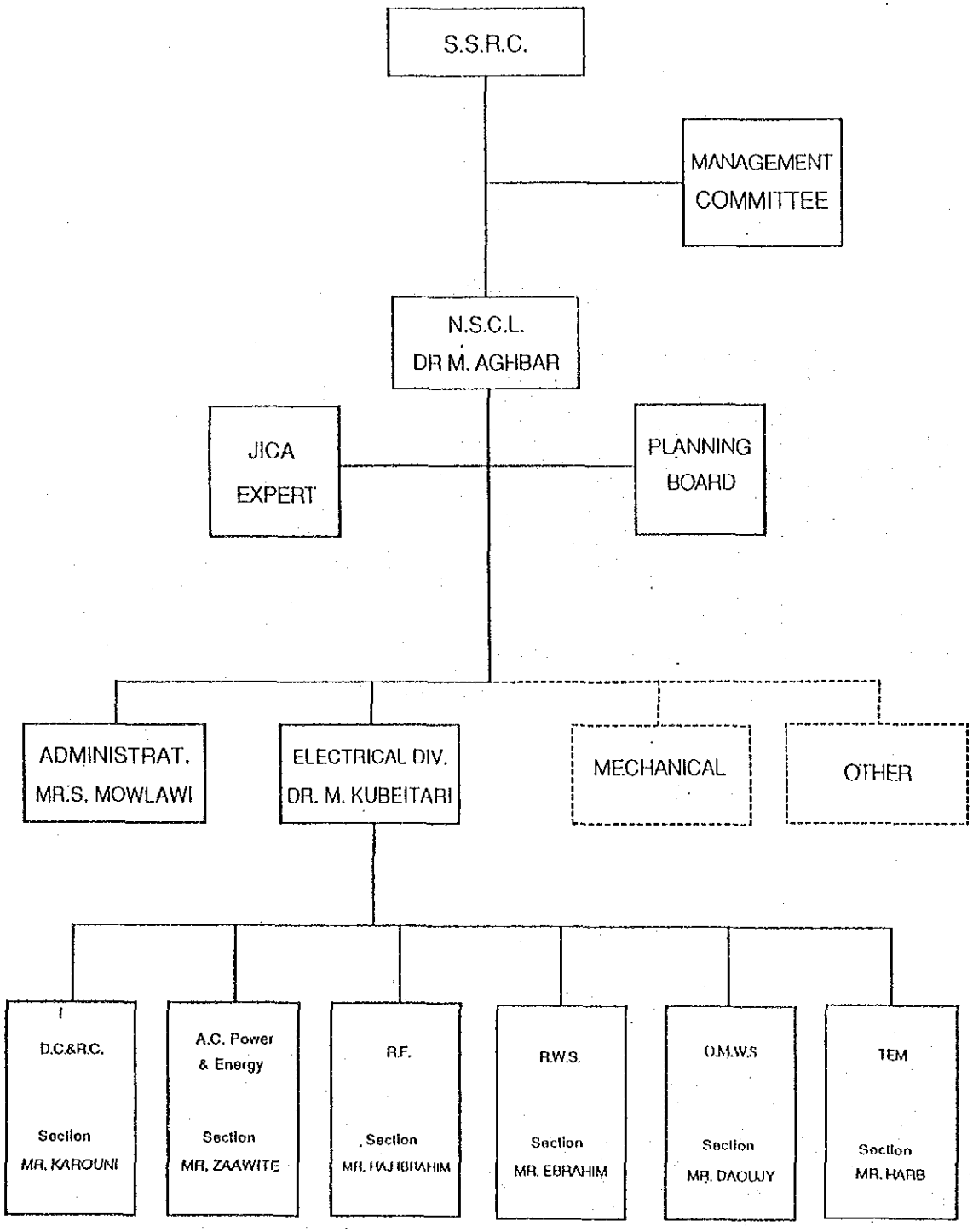
No.	Name	Age	Gradiated	Main Subject (Career)	Section
1	Dr. Mr. M. Aghbar	39	CNAM (Paris)	Metrology, Systems	Director
2	En Mr. M. Noukary	47	Belgrade Univ.	Electrical Eng, Construc.	Executive Manager
3	Dr. Mr. M. Kubellarl	35	Strasbourg,	Instrumentation, Measur.	Technical Manager
			CNAM(Paris)	Metrology, Systems	
4	En Mr. M. Zaawite	38	Damascus, Cairo	Electronic Eng.,	AC ; Section Chief
				Calibration, QC	
5	As Mr. M. Jouma	33	Damascus Inst.	Electronic	AC
6	As Mr. K. Barakat	26	Damascus Inst.	Electronic	AC
7	As Mr. G. Sharani	27	Damascus Inst.	Electronic	AC
8	En Mr. M. Harb	32	Damascus Univ.	Electrical, Power Eng	TEM ; Section Chief
9	En Mr. N. Harba	26	Tishreen Univ.	Electronic Eng.	TEM
10	As Mr. AS Karouni	41	Damascus Inst.	Electronic, test & Cal.Dep	D C ; Section Chief
11	As Mr. E. Salhani	27	Damascus Inst.	Electronic	DC
12	As Mr. W. Saadi	27	Damascus Inst.	Electronic	DC
13	As Mr. M. Hafiri	25	Damascus Inst.	Electronic	DC
14	En Mr. H. Ibrahim	34	Damascus Univ.	Electronic Eng.	R F ; Section Chief
15	As Mr. S. Hassan	36	Damascus Inst.	Electronic	RF
16	As Mr. M. Kashour	34	Damascus Inst.	Electronic	RF
17	En Mr. B. Makkieh	25	Damascus Univ.	Electronic Eng.	RF
18	En Mr. B. A. Adas	25	Damascus Univ.	Electronic Eng.	RF
19	As Mr. M. Z. Sweid	22	Damascus Inst.	Electronic	RF
20	En Mr.S. Al-Zaher	26	Aleppo Univ.	Electronic Eng.	RF
21	En Mr. H. Bustali	23	Damascus Univ.	Electronic, Test Equip.	RF
22	En Mr. S. Reda	27	Damascus Univ.	Electronic Eng.	RF
23	En Mr.R.Ibrahim	35	Aleppo Univ	Electronic Eng.	Repair ; Section Chief
24	As Mr. T. Hajl	34	Damascus Inst.	Electronic	Repair
25	As Mr. N. Elias	32	Damascus Inst.	Electronic	Repair
26	En Mr. S. Anno	29	Damascus Univ.	Electronic Eng.	Repair
27	As Mr. S. Rayan	26	Damascus Inst.	Electric	Repair
28	En Mr.A. Kafelghazal	24	Damascus Univ.	Electronic Eng.	Repair
29	En Mr. E. Al-Manfush	27	Damascus Univ.	Electronic Eng.	Repair

No.	Name	Age	Graduated	Main Subject (Career)	Section
30	En Mr. Housam Assad	27	Damascus Univ.	Electronic Eng.	Repair
31	En Mr. S. Saadeh	26	Damascus Univ.	Electric Eng.	Repair
32	As Mr. K. Saadi	25	Damascus Inst.	Electric	Repair
33	As Mr. I. Kanaan	23	Damascus Inst.	Electronic	Repair
34	En Ms. S. Sharba	32	Damascus Univ.	Electronic Eng.	Repair
35	As Mr.B. Nabulsi	32	Damascus Inst.	electric	Repair
36	As Mr .A.Manaah	30	Damascus Inst.	electronic	Repair
37	En Mr. A. Sultan	26	Damascus Univ.	Electronic Eng.	Repair
38	En Miss. N. Mekdad	25	Damascus Univ.	Electronic Eng.	Repair
39	En Mr.A. M. Daoujy	25	Damascus Univ.	Mechanical Eng.	O M W ; Section chief
40	As Mr. A. Hiadar	32	Damascus Inst.	Fine Mechanic	OMW
41	As Mr. Y.Mohamad	28	Damascus Inst.	Fine Mechanic	OMW
42	As A.H. Al Zaim	25	Damascus Inst.		OMW
43	As Mr. A.H. Saada	30	Damascus Inst.	Electric	Store
44	As Ahmad Kanayh	32	Damascus Inst.	Electronic	Store
45	Mr. M. S. Mawlawi	48	Cairo Univ.	Bachelor of Commerce & Financial Science	Admini.
46	Mr. D. Al Jbawi	29	Damascus Univ.		Admini.
47	Mr. R. Musto	24	Damascus Univ.		Admini.
48	Mr. S. Odabashi	28	Damascus Inst.	Secretariat	Computer
49	Mr. A. Zeitoun	45			Admini.
50	Ms. L. Tohmeh	37	Damascus Inst.	Secretariat	Library
51	Ms. R. Safadi	26	Damascus Inst.	Accountancy	Secretary
52	Mr. N.Tamar	24			Reception
53	Mr. M. Shahla	21			Reception
54	Mr. A. Zeitoon	20			Reception
55	Mr. G. Alafe	21			Canteen
56	Mr. S. Ibrahim	44			Services
57	Mr. A. Henawi	21			Services
58	Mr. H. Aleid	25			Services
59	Mr. B. Nour Al-Din	34			Driver

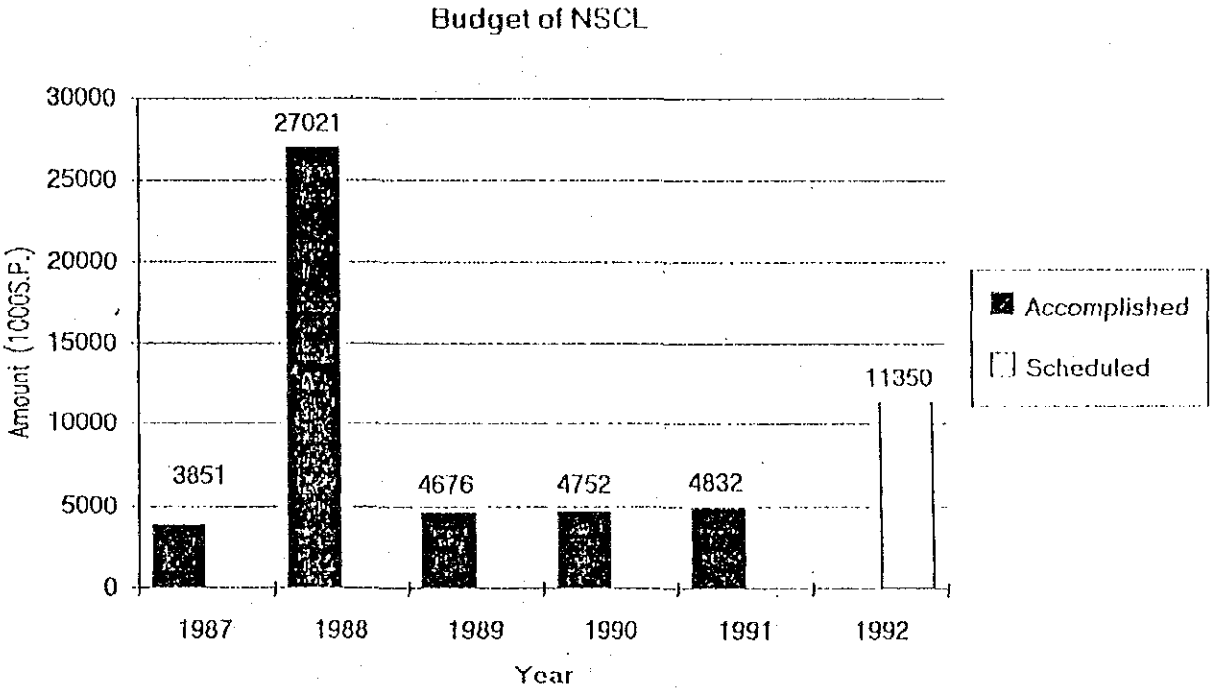

Personnel Number vs Time
Number
60
50
40
30
20
10
0
Sep-88
Apr-89
Oct-89
May-90
Nov-90
Jun-91
Dec-91
Jul-92
Month-Year

Annex7

ORGANIZATION chart of NSCL



Annex 8-1


Budget of NSCL
30000
25000
20000
15000
10000
5000
0
Amount (1000S.P.)
27021
11350
3851
4676
4752
4832
1987
1988
1989
1990
1991
1992
Year
Accomplished
Scheduled

Annex 8-2

Detailed Budget of NSCL from 1990-1992

	Description	In (S.P.) 1990 Real	In (S.P.) 1991 Scheduled	In (S.P.) 1991 Real	In (S.P) 1992 Scheduled
1	Wages & salaries	2 432 244	2 600 000	2 798 667	3 000 000
2	Administrative fees	212 704	250 000	390 452	420 000
3	Air conditioning system (Engineering Works)	1 500 000	1 000 000		1 500 000
4	Water, electricity and telecom.	215 020	230 000	509 616	600 000
5	Heating	121 332	130 000	99 900	130 000
6	Spare parts and material	102 037	600 000	411 481	5 000 000
7	Furniture	168 962	190 000	142 050	150 000
8	Social and medical assurance	Not mentioned	Not mentioned	480 000	550 000
	Total :	4 752 299	5 000 000	4 832 166	11 350 000

Annex 9

TECHNICAL CO-OPERATION PLAN

(1) NSCL property control
(secondary,tertiary and repair systems)

(2) preparation of calibration procedures (secondary)
or
Calibration by upper level measuring instruments and
periodic calibration(Tertiary + repair benches).

(3) preparation of record format (secondary).
or
Practice of trouble-shooting (tertiary +repair systems).

(4) Accuracy checking of measuring instruments (secondary).
or
Practice of adjustment and Calibration (tertiary).

(5) Calibration of lower level measuring instruments
(primary,secondary).
or
Preparation of repair report (tertiary & repair).

(6) NSCL property control (primary)

(7) Preparation of calibration procedures (primary).
or
Maintenance and rule of tools and auxiliary
equipment,periodic check
(tertiary and repair work-shop)

(8) Accuracy checking of measuring instruments(primary).

(9) Calibration of lower level measuring instruments (primary)

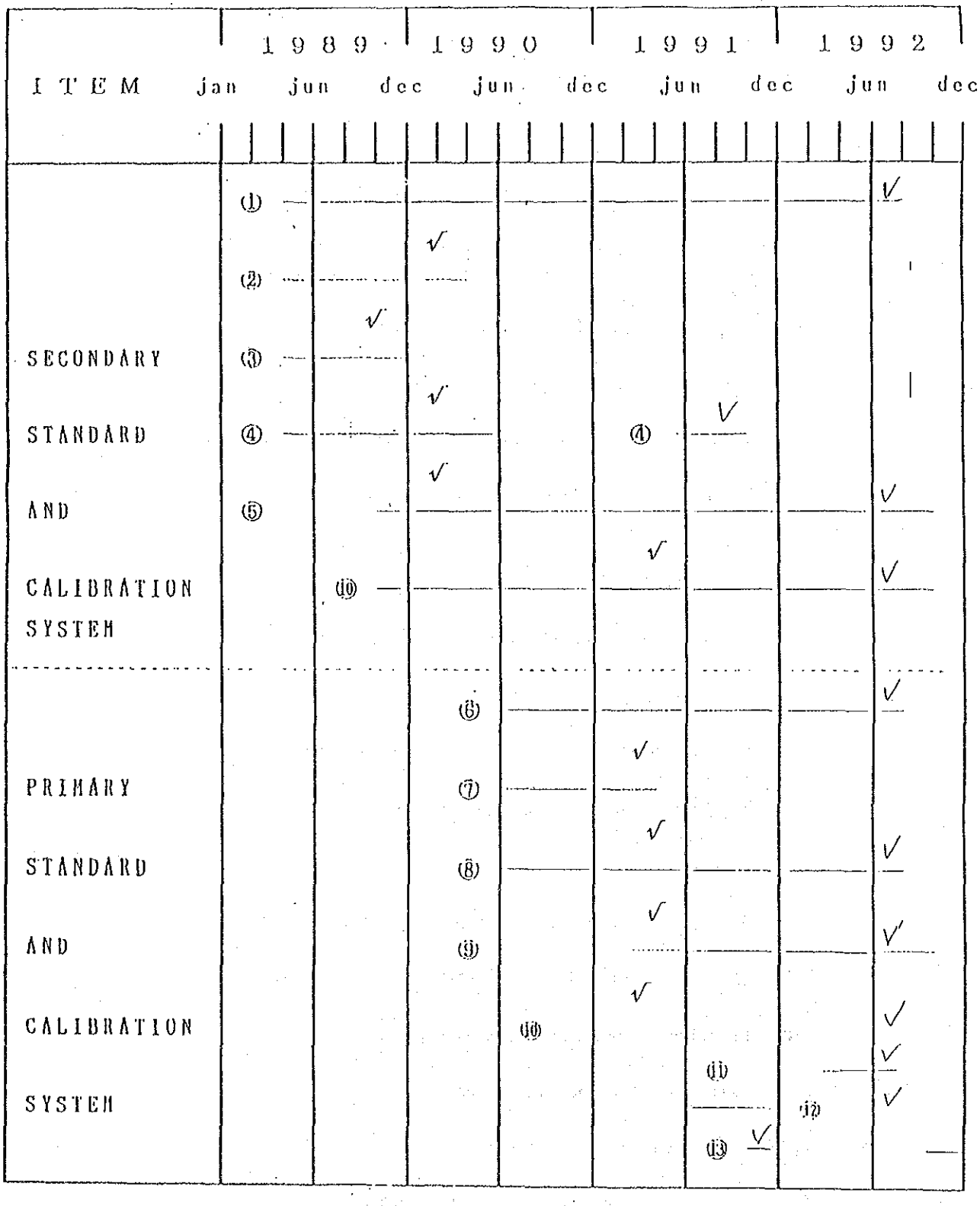
(10) Practice of calibration service(primary).

(11) Evalution of primary stanards .

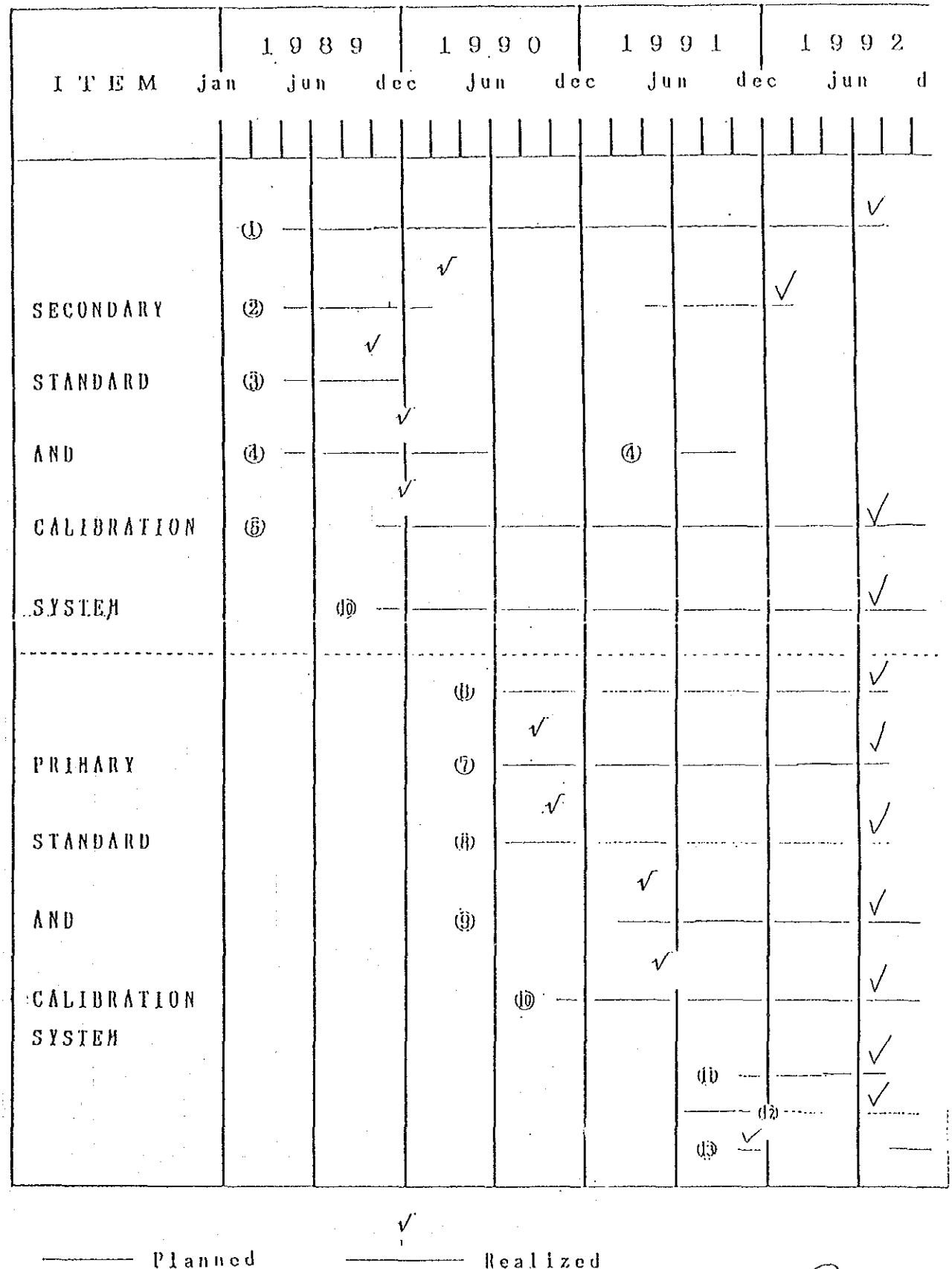
(12) Periodic calibration (primary).

(13) Use of transfer standard to check & calibrate
National standards of NSCL

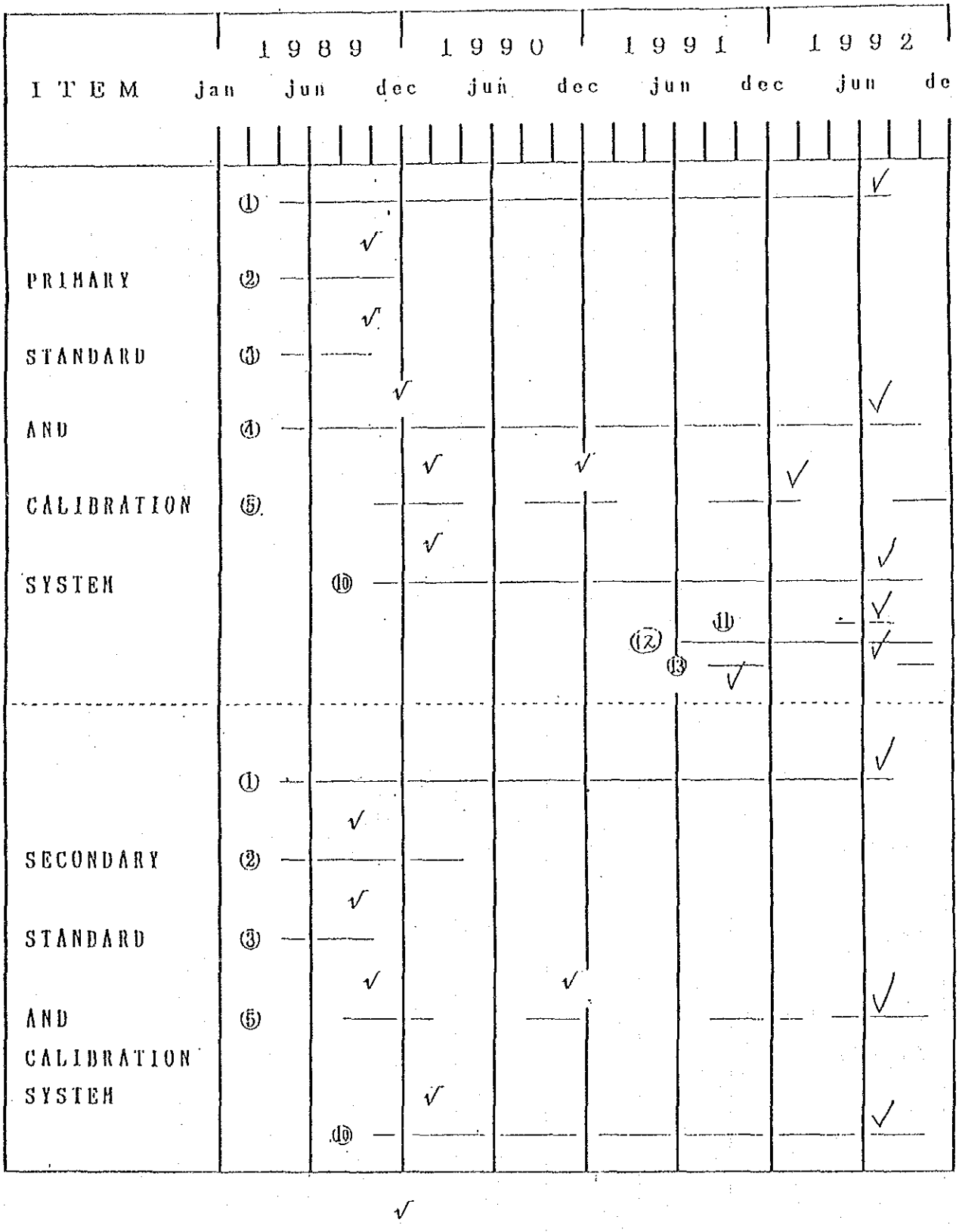
1, DC. VOLTAGE AND CURRENT STANDARD AND CALIBRATION SYSTEM



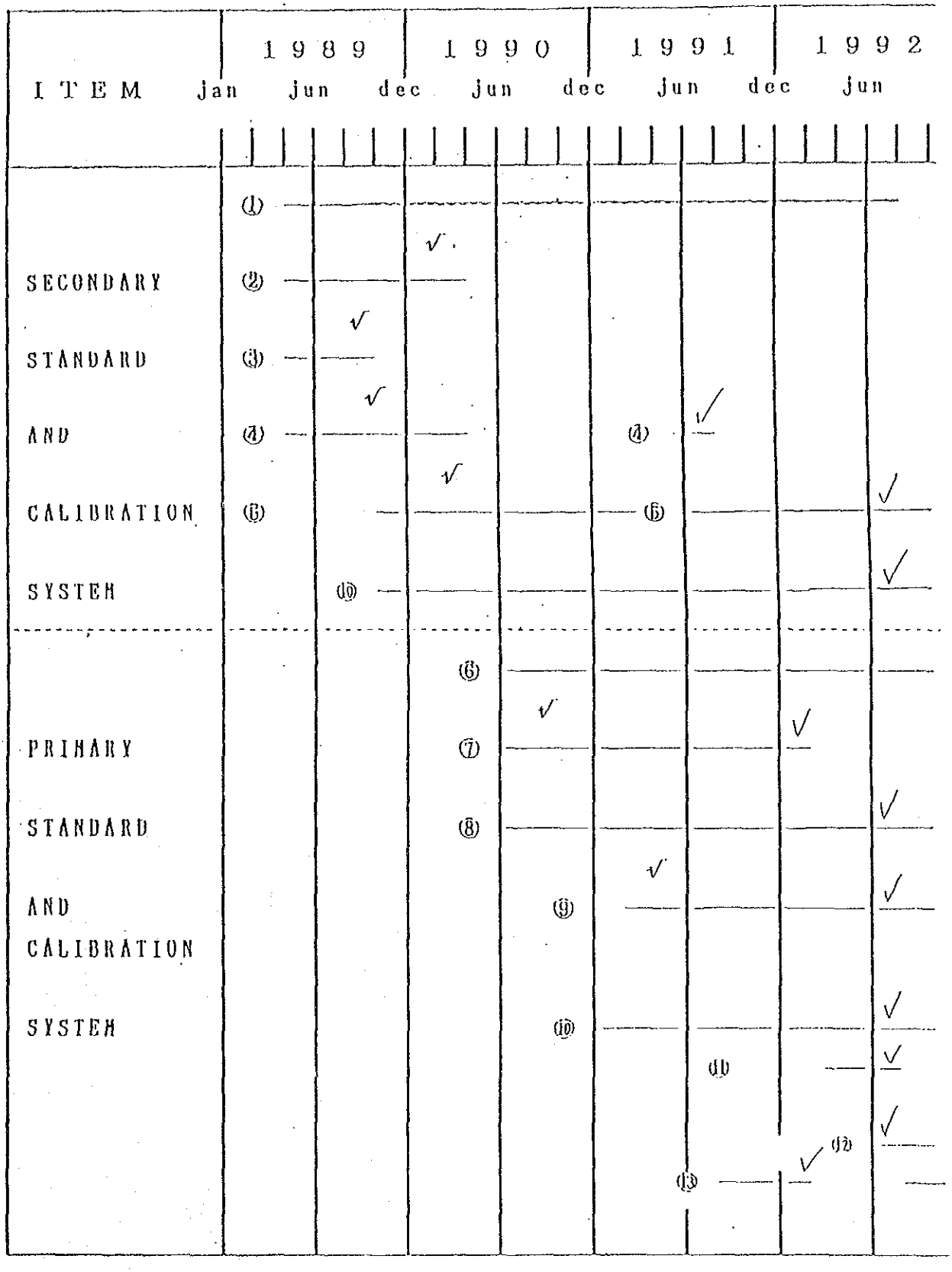
2, RESISTANCE AND CAPACITANCE STANDARD AND CALIBRATION SYSTEM



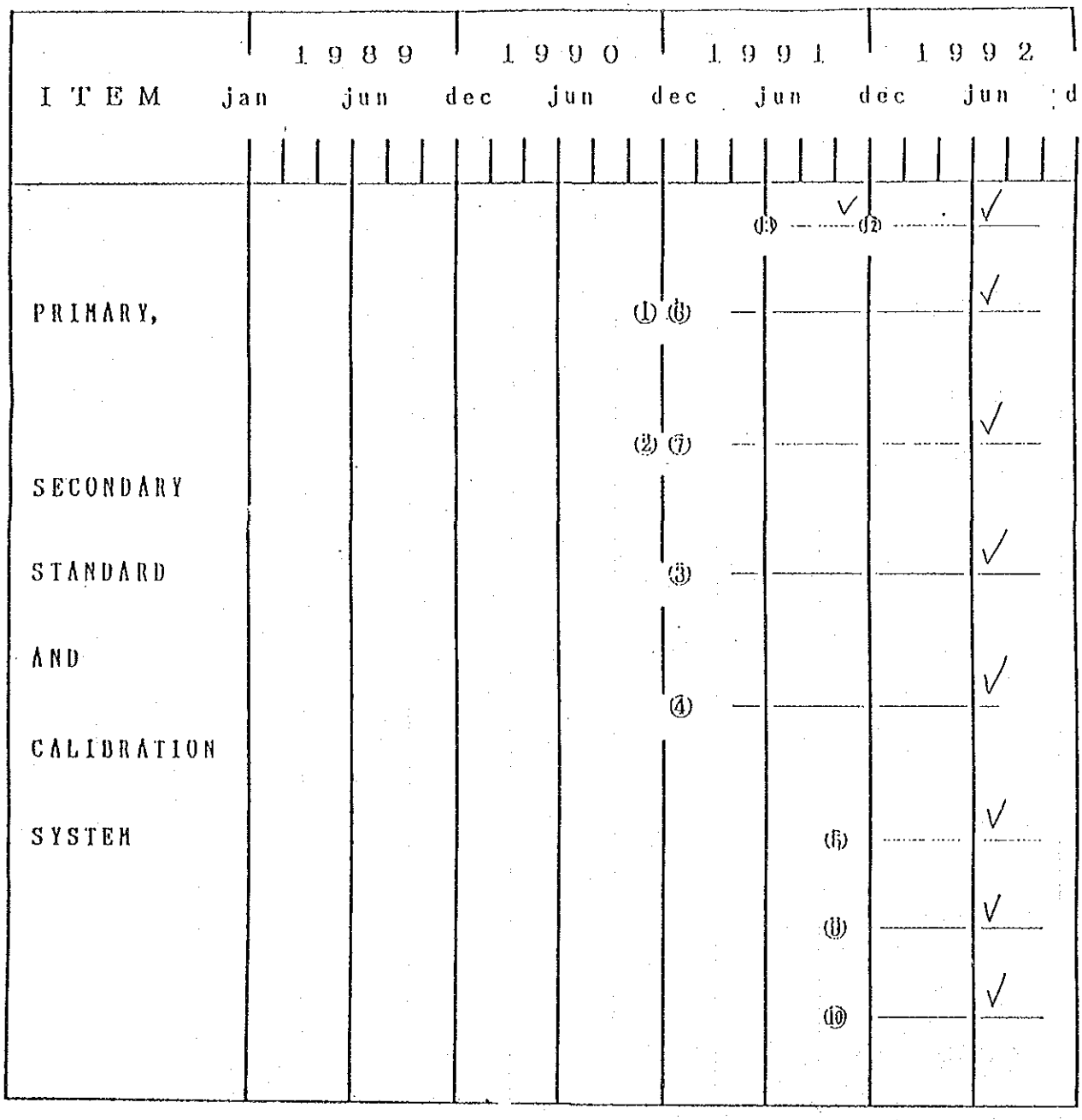
3, TEMPERATURE STANDARD AND CALIBRATION SYSTEM



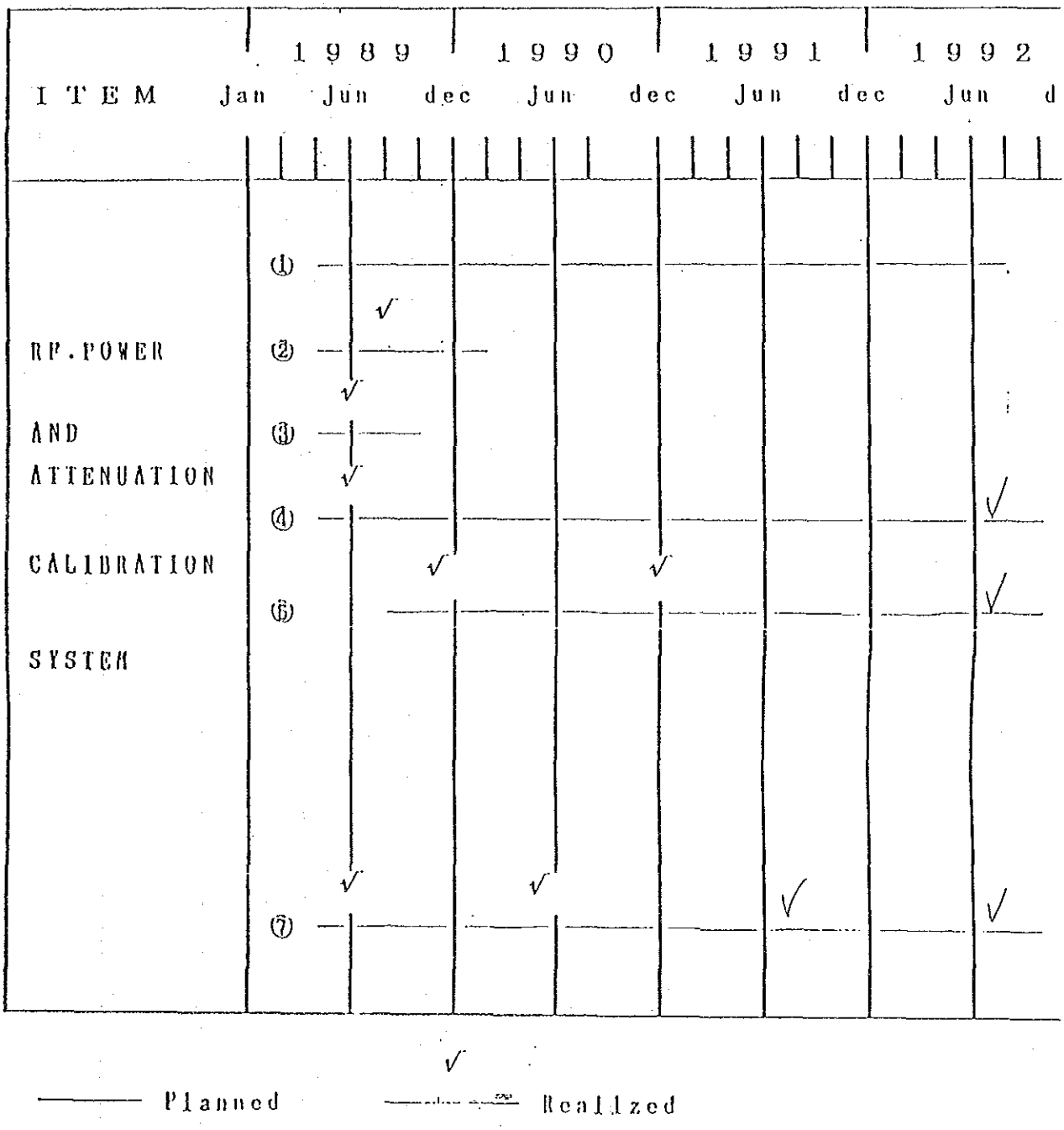
4, AC. VOLTAGE AND CURRENT



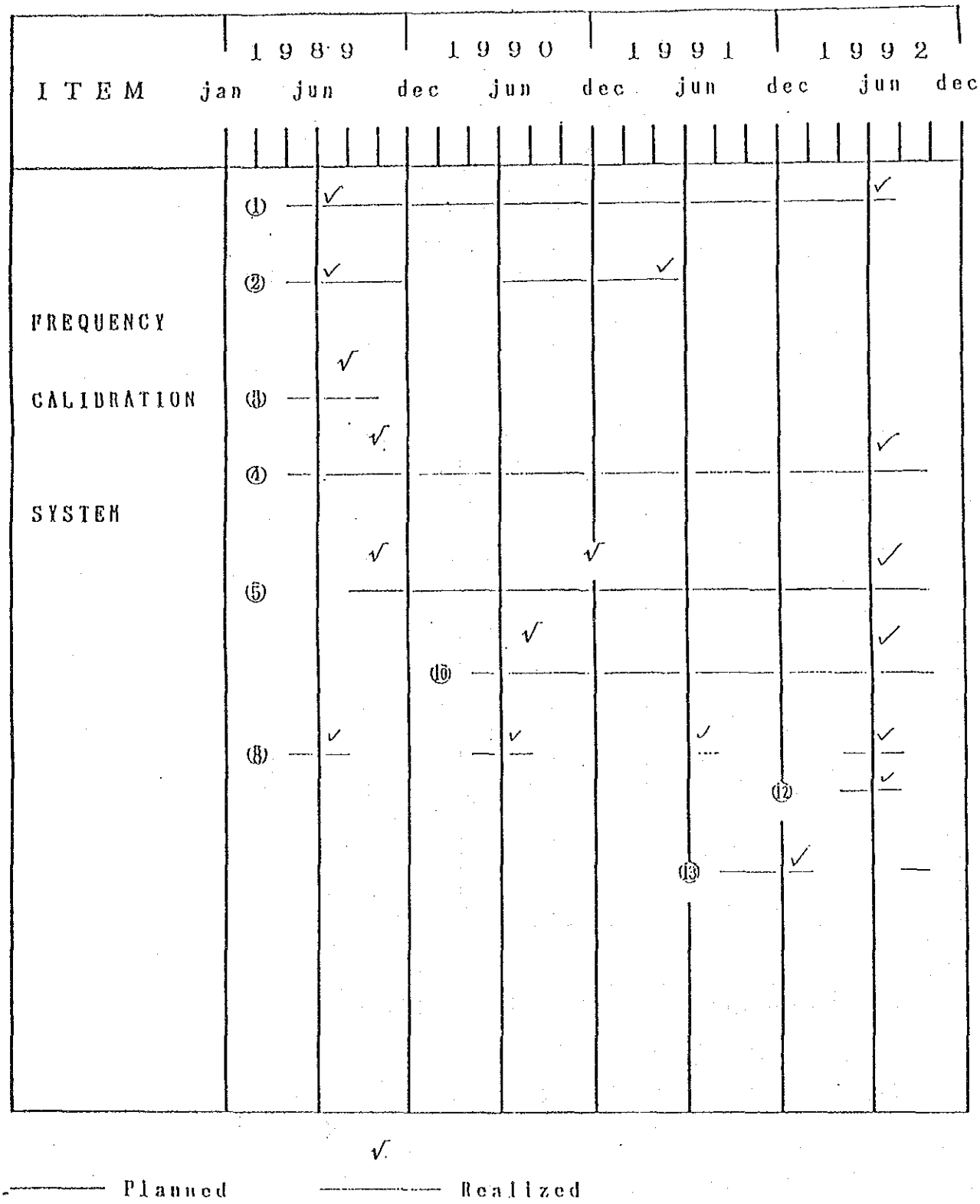
5, ELECTRIC POWER AND ENERGY



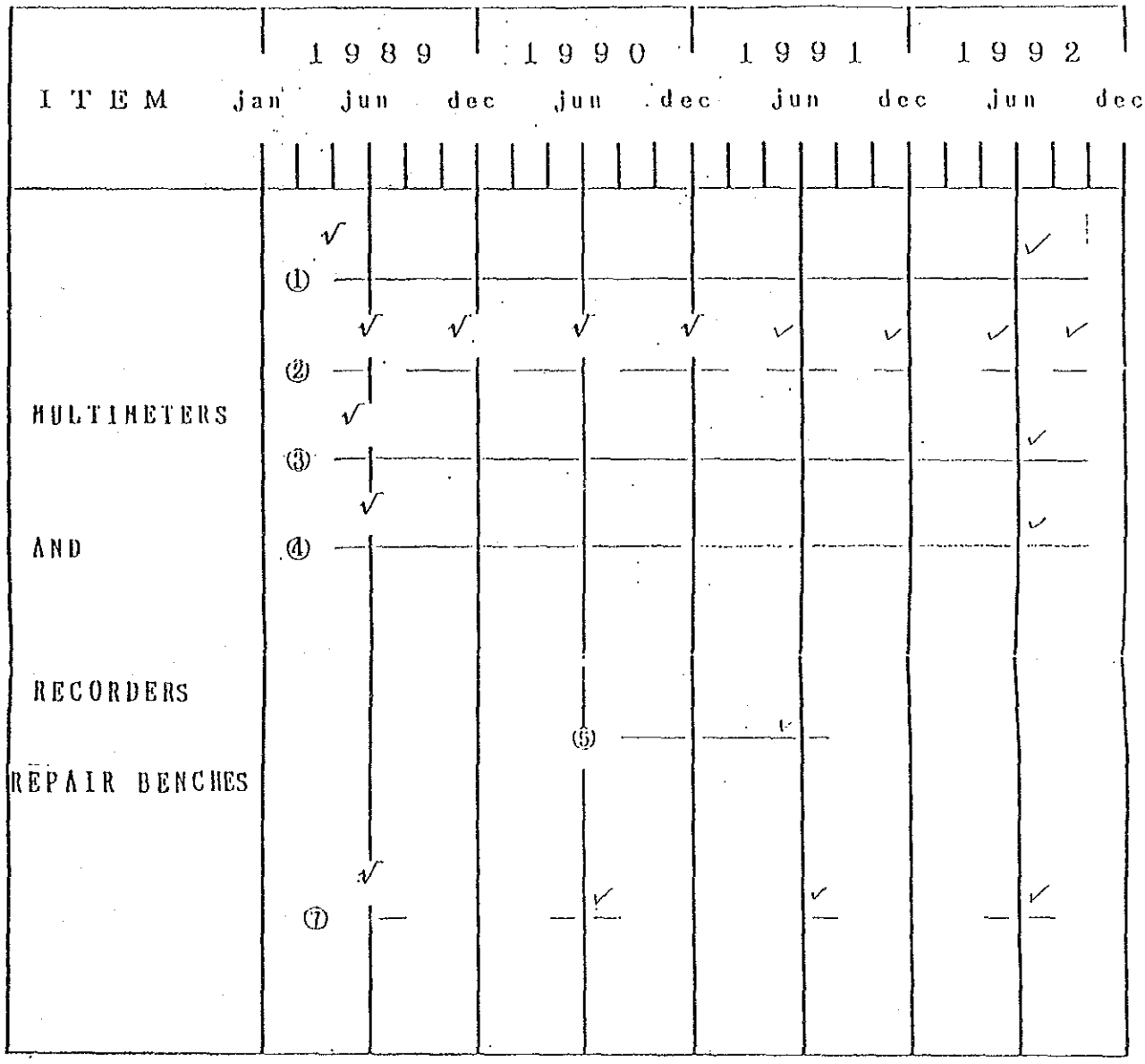
0, RF. POWER AND ATTENUATION



7., FREQUFNCY


1989
1990
1991
1992
ITEM
jan
jun
dec
jun
dec
jun
dec
jun
dec
FREQUENCY
CALIBRATION
SYSTEM
①
②
③
④
⑤
⑩
⑧
⑫
⑬
Planned
Realized

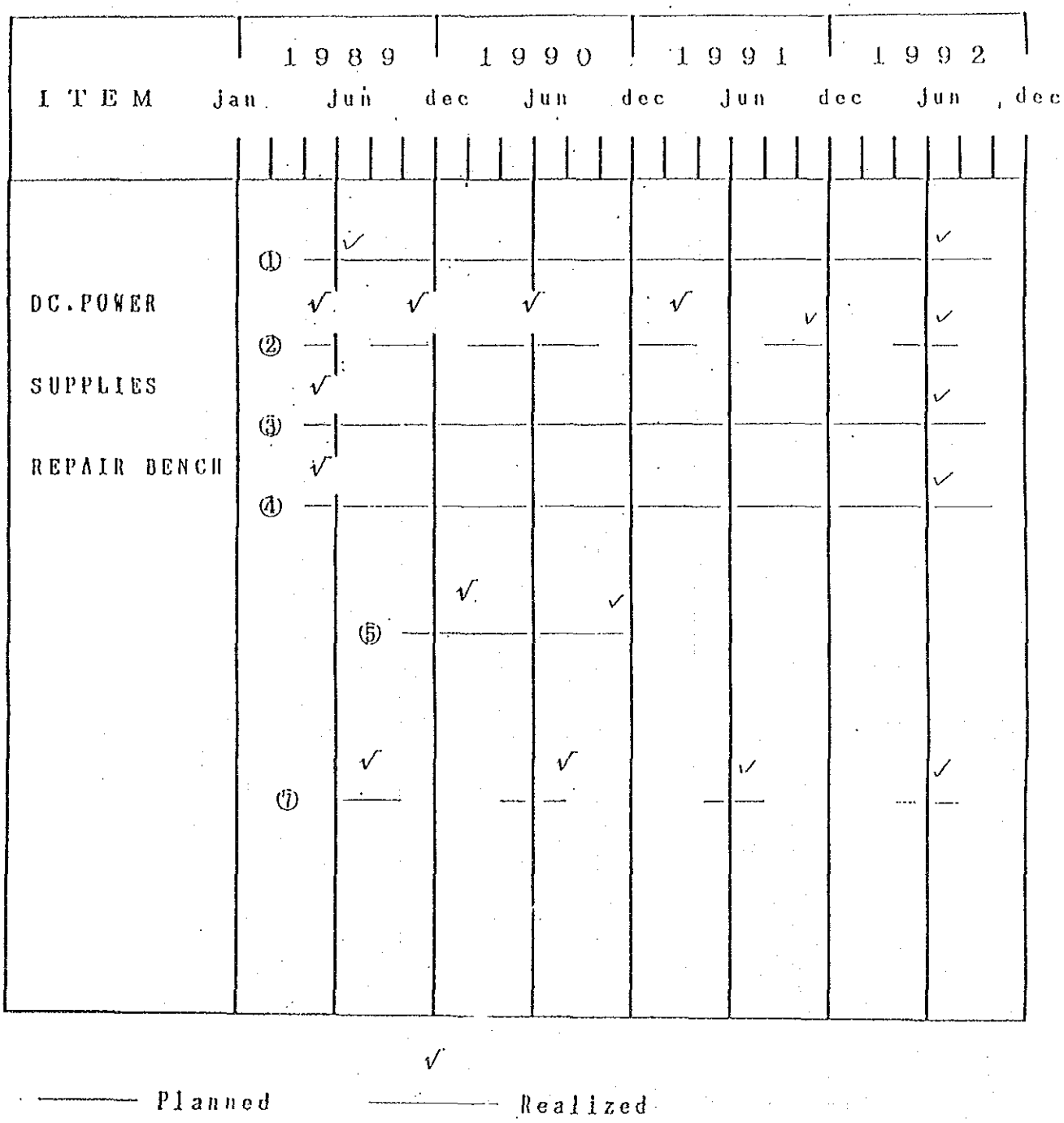
8, MULTIMETERS AND RECORDERS



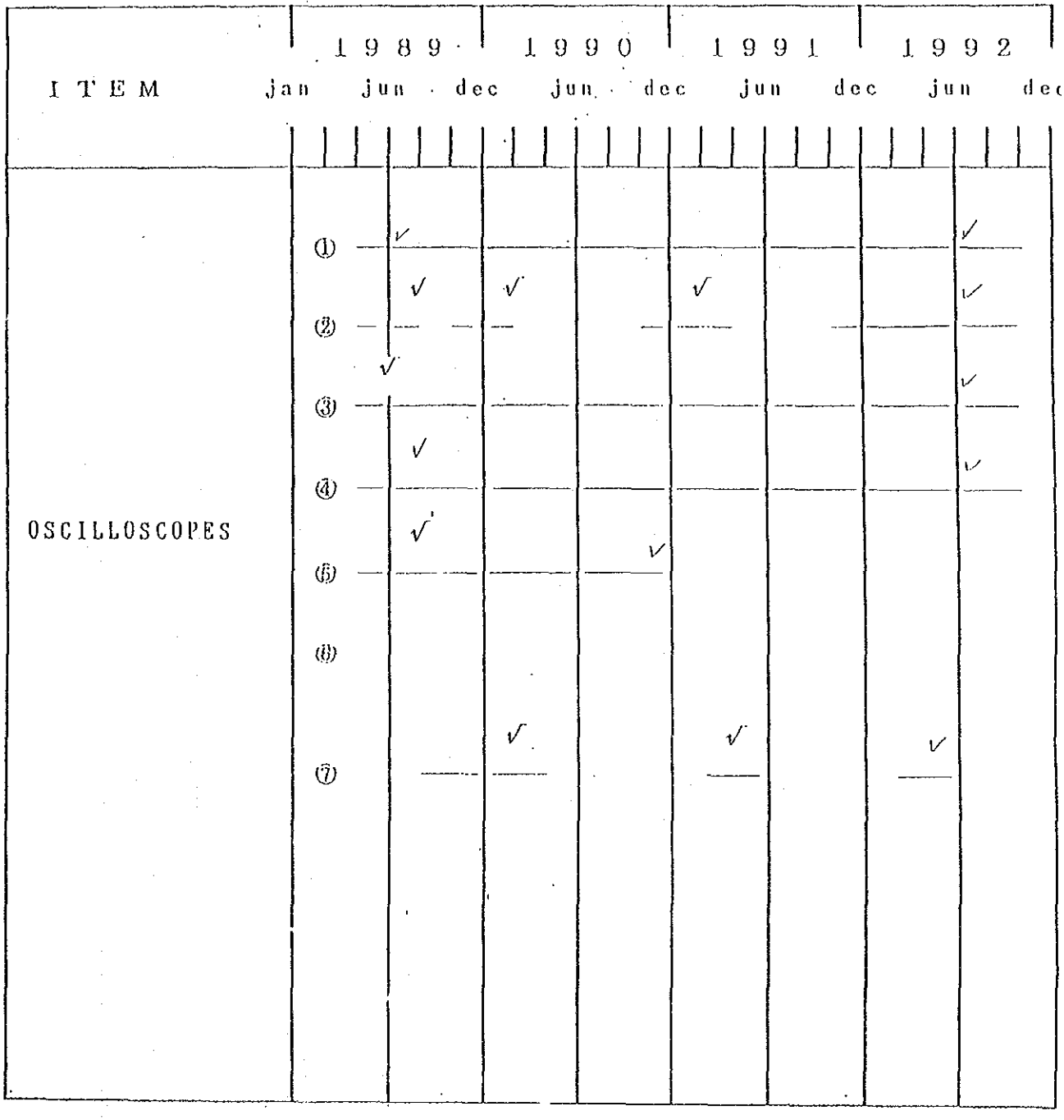
√

——— Planned — ——— Realized

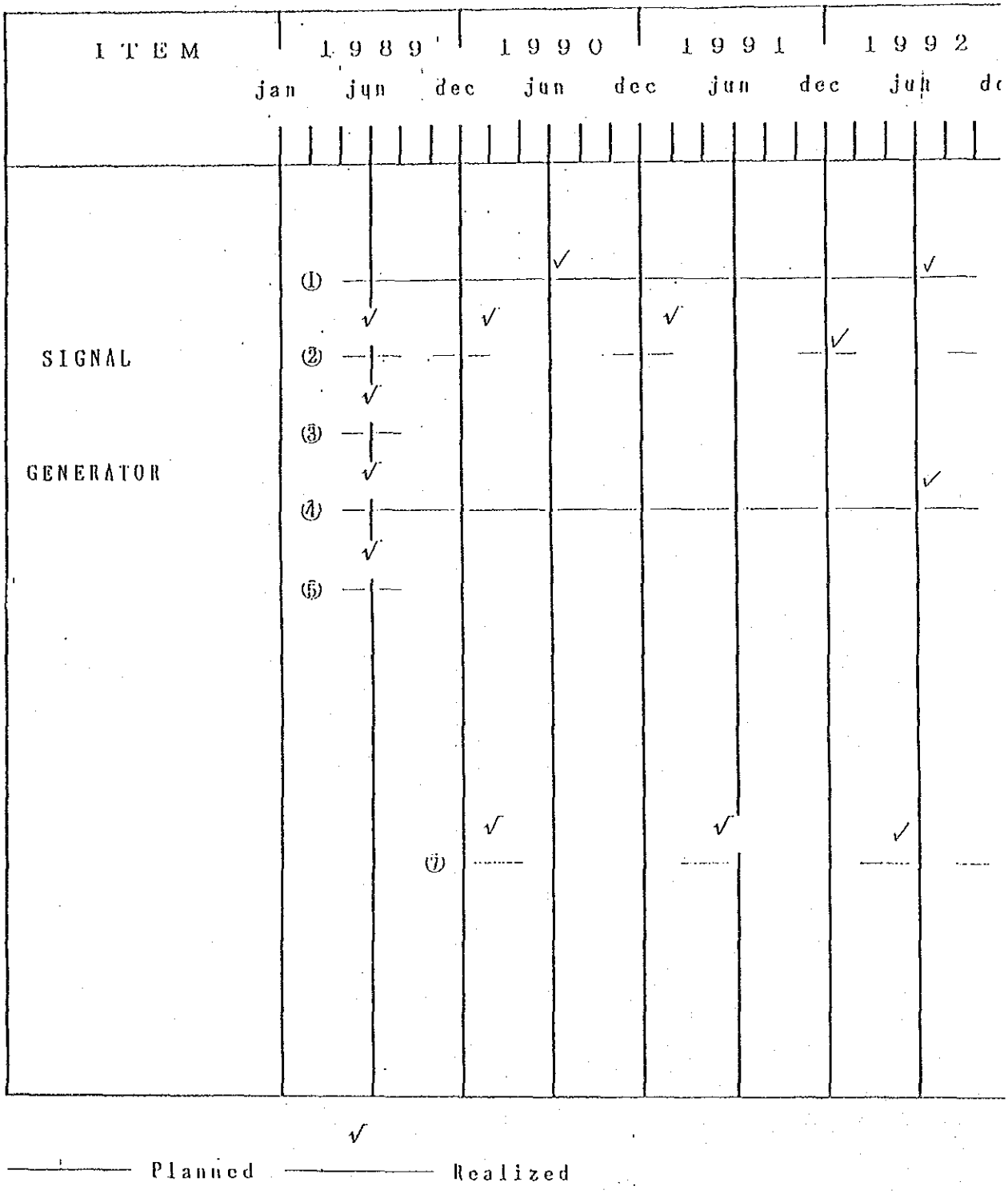
·9, DC.POWER SUPPLIES



10, OSCILLOSCOPES



11, SIGNAL GENERATOR



Annex 10-1

Number of technical documents

DOCUMENTS UNDER PREPARATION													
LAB		AC		DC		TEM		RF		REP		OSC	
CAL/ADJ		a	b	a	b	a	b	a	b	a	b	a	b
PROCEDURE	P	2	0	1	0	0	0	0	0	0	0	0	0
	S	4	0	2	2	0	0	11	0	0	0	0	0
	T	5	0	0	0	0	0	10	0	0	0	0	0
FORMAT	P	0	0	0	0	0	0	0	0	0	0	0	0
OF RESULT	S	0	0	3	1	0	0	0	0	0	0	0	0
SHEET	T	0	0	0	0	0	0	0	0	0	0	0	0

a- Number of technical documents for the instruments belonging to each mentioned lab in NSCL .
b- Number of technical documents for the instruments concerning the other labs in NSCL .
c- Number of technical documents for the instruments belonging to outside customers.

P: Primary std S: Secondary std T: Tertiary std and Measuring inst

DOCUMENTS ALREADY PREPARED																			
LAB		AC & POWER			DC & RC			TEMP			RF			REP			OSC		
CAL/ADJ		a	b	C	a	b	C	a	b	C	a	b	C	a	b	C	a	b	C
PROCEDURE	P	2	0	0	2	0	0	2	0	0	1	0	0	0	0	0	0	0	0
	S	3	0	0	18	5	0	2	1	0	2	0	0	0	0	0	0	0	0
	T	5	1	3	0	0	0	5	0	2	0	0	0	7	0	11	2	0	0
RESULT	P	4	0	0	6	3	4	5	0	0	1	0	1	0	0	0	0	0	0
SHEET	S	7	6	0	34	18	105	2	1	0	17	0	0	0	0	0	0	0	0
	T	10	0	102	4	8	45	6	6	10	11	2	69	13	0	10	1	0	0

a- Number of technical documents for the instruments belonging to each mentioned lab in NSCL .
b- Number of technical documents for the instruments concerning the other labs in NSCL .
c- Number of technical documents for the instruments belonging to outside customers.

P: Primary std, S: Secondary std. T: Tertiary std and Measuring inst.

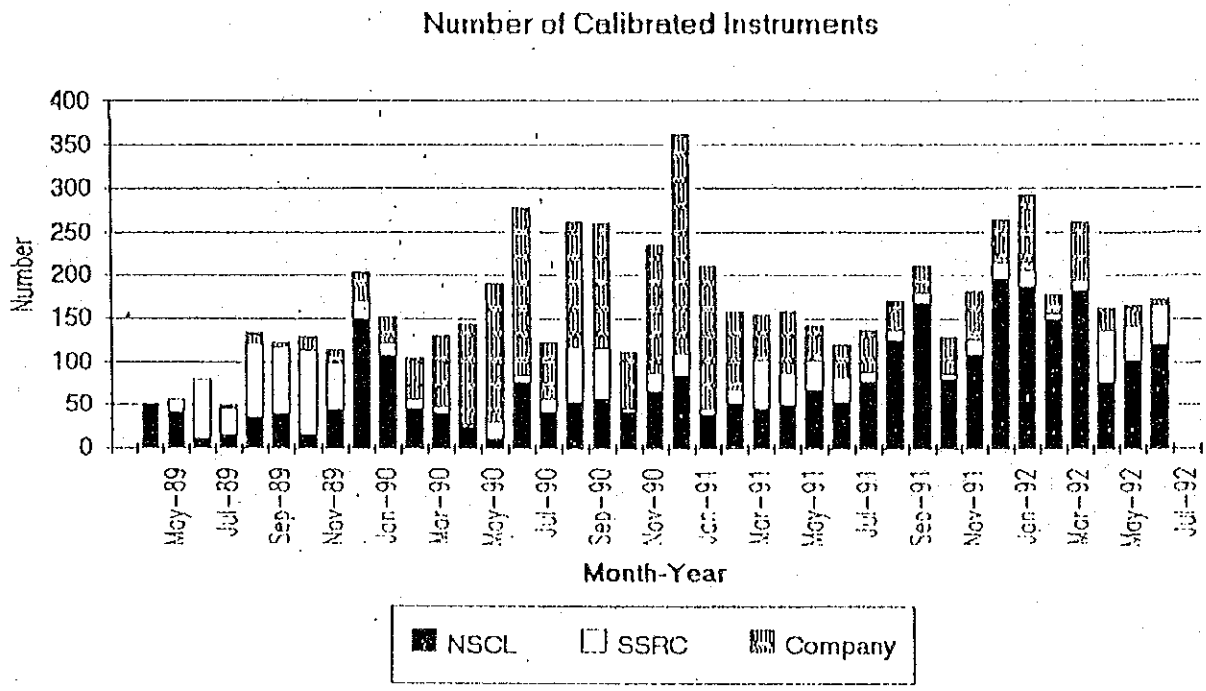
Annex 10-2

List of prepared calibration procedures

Item No.	Description	Type	Section
1	DC. Reference Standard	Fluke 732A	DC
2	DC. Reference Standard	Fluke 731B	DC
3	DC. Autocal Standard	Datron 4000A	DC
4	DC. Voltage Current Standard	YEW 2552/2561	DC
5	Standard Voltage Ratio Box	YEW 2746	DC
6	Precision Digital Multimeter	YEW 2501A	DC
7	Digital Multimeter	YEW 2502A	DC
8	Standard Resistors using DCCB9975	YEW 2781, 2794, 2792	DC
9	Standard Resistors using Double Bridge 2752	YEW 2792	DC
10	Precision Double Bridge	YEW 2752	DC
11	Decade Resistance Box using 2768 Wheatstone Bridge	YEW 2793, 2786, DB62	DC
12	Decade Resistance Box	ESI, DB62	DC
13	High Resistance Meter	HP 4329A	DC
14	High Impedance voltmeter /Null-Detector	HP 845AB	DC
15	Standard Capacitors using HP 4274A	HP 16380A, SM 228C & SM330D	DC
16	Decade Capacitor using HP 4274A	HP 4440B	DC
17	Multi-Frequency LCR Meter	HP 4274A	DC
18	Digital LCR Meter	HP 4261A	DC
19	DC. Reference Standard, Evaluation Standard	Fluke 732A	DC
20	Reference Standard Capacitor using 1620-AP	G.R 1404A	DC
21	Calibration Method of the 2794 Evaluation	YEW 2794	DC
	Standard Resistors		DC
22	AC Standard	Datron 4200A	AC
23	Self Cal. Digital Multimeter	Datron 1281	AC
24	AC Voltage and Current Standard	YEW 2558	AC
25	Digital AC Power Meter	YEW 2503	AC
26	Frequency Transducer	YEW 2388	AC
27	AC Voltage Transducer (150V)	YEW 2383	AC
28	AC Voltage Transducer (300V)	YEW 2383	AC
29	AC Amper Tansducer (1A)	YEW 2383	AC
30	AC Amper Transducer (5A)	YEW 2383	AC

Item No.	Description	Type	Section
31	Digital Multimeter	YEW 2502	AC
32	Digital Multimeter	YEW 2501	AC
33	Digital Multimeter	H.P 3435	AC
34	Digital Multimeter	H.P 3455	AC
35	Digital Multimeter	Racal-Dana 4003	AC
36	Intercomparison of Primary RTD	Pt-25	TEM
37	Calibration of RTD Secondary Standard	Pt-100	TEM
38	Intercomparison of Primary Thermocouple	S	TEM
39	Calibration of Secondary Standard Thermocouple	R	TEM
40	Calibration of Thermocouple	K	TEM
41	Calibration of Thermocouple	J	TEM
42	Calibration of Thermocouple	E	TEM
43	Calibration of Thermocouple	T	TEM
44	Calibration of Digital Resistance Thermometer	YEW 2804	TEM
45	Calibration of Thermocouple Thermometer in general by Electrical Signal	–	TEM TEM
46	Calibration of Thermometers by Actual Temperature	–	TEM TEM
47	Stability of Constant Temperature Oil Bath	9732VT	TEM
48	Rubidium Freq. Std.	Rb-1008C	RF
49	Step Attenuator + (programmable Att.)	HP(8494A-8496A) + (MN63A)	RF
50	Rang Calibrator	MA4001A	RF
51	Network/Spectrum Analyzer	MS620J	RF
52	S- Parameter Test Set	MH (682J-683J)	RF
53	Synthesized Signal Generator	MG 655A	RF
54	Synthesizer/ Level Generator	MG 443 B	RF
55	Power Meter	ML 4803 A	RF
56	Power Sensor	MA4601 A - MA4702 A	RF
57	Crystal Oscillator	XSD-2	RF
58	Freq. Counter	MF 63A	RF
59	Terminators	Set	RF

Item No.	Description	Type	Section
60	Electronic Voltmeter	ML 69A	RF
61	Fixed Attenuator	MP 721	RF
62	Modulation Analyzer	MS 616 A	RF
63	Spectrum Analyzer	MS 611 A	RF
64	Selective Level Meter	ML 422 A	RF
65	Signal Generator	MG 3601 A	RF
66	Distortion Measurement	HP 339 A	RF
67	Function Generator	HP 3314 A	RF
68	Universal Counter	HP 3516 B	RF
69	Pre — Amplifier	MH 648 A	RF
70	Low Pass Filter	LLF-105	RF
71	Pen Recorder	YEW 3056	Rep
72	Hybrid Recorder	YEW 3081	Rep
73	DC. Power Supply	Kikusui PAR 160A-80A	Rep
74	Digital Hygrometer	YEW 2577	Rep
75	Multimeter	For All Type	Rep
76	Oscilloscope	For All Type	Rep


Number of Calibrated Instruments
Number
400
350
300
250
200
150
100
50
0
May-89
Jul-89
Sep-89
Nov-89
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Mar-90
May-90
Jul-90
Sep-90
Nov-90
Jan-91
Mar-91
May-91
Jul-91
Sep-91
Nov-91
Jan-92
Mar-92
May-92
Jul-92
Month-Year
NSCL
SSRC
Company

Annex 12

List of General Luctuers

TITLE OF LECTURE	NAME OF LECTURER	DATE:
1- DC voltage standards and their measurements	Mr. AS.Karouni	17-12-1988
2- Frequency measurement & traceability in Japan	Dr. M.Aghbar	15-11-1989
3- IPTS - 68 and practical temperature measurements	Dr. M.Aghbar	21-6-1989
4- Precise measurement by using superconductivity	Mr. Nakamoura	11-7-1989
5- Temperature (standards & measurements) in temperature laboratory	Mr. M.Harb	26-8-1989
6- Calibration philosophy and explanation of some terms	Mr. M.Zaawite	18-9-1989
7- The comparison and maintenance of standards of electromotive force.	Mr. AS.Karouni	27-9-1989
8- National standard & calibration laboratory	Dr.M.Aghbar	25-11-1989

DATE	LECTURER	TITLE	LANGUAGE
14-3-1990	Mr.M.Harb	Programming the RAM function of XY-pllotter2000	A
2-5-1990	Mr.A.Karouni	The procedure of using the DATA BOOK , and how to find the equivalents of a device	A
20-5-1990	Mr.B.A.Adas	Filters	A
23-5-1990	Mr.A.Karouni	Soldering and assembly of electronic components	A
29-5-1990	Mr.Noguchi	Traceability	E
30-5-1990	Mr.S.Akrami	Air-Condition system and maintonance	E
3-6-1990	Mr.M.Hafiri	Logic circuits	A
11-6-1990	Mr.M.Aghbar	New representations of Volt & Ohm.	E
17-6-1990	Mr.A.Karouni	The procedure of using the DATA BOOK and how to find the equivalents of a divisor (repeated)	A
27-6-1990	Mr.S.Amro	Resonance circuits	A
29-7-1990	Mr.T.Haji	Fundamentals of oscilloscope and oscilloscope basic system dingram.	A
5-8-1990	Mr.Abu.Adnan	Applications about the main logic gates	A

7-8-1990	Mr.K.Barakat	Methods of testing some conductors.	A
11-8-1990	Mr.K.Saadi.	Non active elements(resistors, capacitors , inductors) how to measure and read.	A
18-8-1990	Mr.A.Karouni	Stabilized DC power supply	A
21-8-1990	Mr.W.Saadi	Low voltage measurements the use of the ratio box Yew 2747	E
26-8-1990	Mr.S.Hasan	Pulse signal and pulse generation circuits	A
19-9-1990	Mr.G.Abed	Legal metrology and the career of metrology.	A
24-9-1990	Mr.E.Kanaan	Operational amplifactor	A
13-10-1990	Mr.A.Karouni	Precise DC voltage measurements .	E
20-10-1990	Mr.S.Hasan	Principles of radio frequency and mismatching.	A
23-10-1990	Mr.M.Z.Swed	Flip flops and counters	A
2-12-1990	Mr.G.Shaarani	Field effect transistors	A
11-5-1991	Mr.N.Harba	Sine wave oscillators	A
28-5-1991	Mr.M.Aghbar	NSCL	A
28-5-1991	Mr.Aghbar	How to express the final result of measurements	A
16-6-1991	Mr.E.Salhani	The interference, grounding shielding and the other techniques used to reduce noise	A
18-6-1991	Mr.A.H.Sada	Safety procedures during work "Industrial Security"	A

Date	Lecturer	Title	language
16-7-1991	Mr. S. Rayan	Electrical measurement and its errors	A
28-8-1991	Mr. A. Daougi	Mechanical measuring instruments	A
4-9-1991	Mr. A. Headar	The principle of photocopy work and how to use it	A
22-9-1991	Mr. M. K. Haj-Ebrahim	GP - IB , IEEE 488	A
25-9-1990	Mr. A. S. Karouni	The calibration method of the 732A DC reference standard "Evaluation Standard"	E
1-10-1991	Mr. M. Haferi	How data digest are organized	A
2-10-1991	Dr. Yamanochi	What uncertainty means and how to determine the uncertainty of your system	E
2-10-1991	Mr. A. S. Karouni	Method and system used to calibrate "2794 the evalution standard"	E
7-10-1991	Mr. N. Elias	The principle of digital measuring equipment	A
9-10-1991	Mr. A. S. Karouni	The calibration method of the GR 1404A evaluation standard capacitors	E
12-10-1991	Mr. M. Harb	Evaluation standard resistance temperature detector (PT-25)	E
15-10-1991	Dr. M. Kubeitari	Calibrating very high resistance (Measurement of resistance Between 10 - 10 Ω)	A
16-10-1991	M. A. S. Karouni	The accuracy improvement of the 732A calibration method on the range 10V	E
21-10-1991	Mr. S. Sadah	Electrical lighting	A
22-10-1991	Mr. A. S. Karouni & Mr. W. Saadi	The standard resistor and their measurement methods	A
4-11-1991	Mr. Z. Sweed	Arials: their kinds & methods of using	E
10-11-1991	Mr. K. Saadi	Power supplies	A
11-11-1991	Mr. N. Harba	Multimeter	A
13-11-1991	Mr. H. Bastati	A study about the structure of the computer by using the processr 8085A	A
13-11-1991	Dr. Yamanochi	30 Minutes forum uncertainy(5) various sources of uncertainty	E
16-11-1991	Mr. S. Amro	Oscilloscopes	A
20-11-1991	Dr. Yamanochi	30 Minutes forum: uncertainty(6), various sources of uncertainty	E
20-11-1991	Mr. W. Saadi	The calibration method of 1281 actual D.M.M.	A
20-11-1991	Mr. B. Makia	A/D, D/A convertor	A
23-11-1991	Mr. K. Barakat	Method of calibration of electronic watthour meter	A
26-11-1991	Mr. B. Abo Adas	Signal generator calibration	A
27-11-1991	Mr. E. Kanaan	A. V. R. ups	A
25-11-1991	Mr. M. Jomaa	AC Voltage/current standard 2558	A
4-12-1991	Mr. M. Jomaa	Calibration Method of digital power meter 2503	A
7-12-1991	Mr. K. Barakat	Calibration Method of current transformers	A
8-12-1991	Mr. M. Haferi	Calibration method of digital multimeter 2502 A by using 2552	A
11-12-1991	Dr. Yamanochi	30 Minutes Forum: uncertainty(7), various sources of uncertainty	E
11-12-1991	Mr. Z. Sweed	Using and calibrating frequency counter Type:/MF63A/	A
18-12-1991	Mr. M. Haferi	Standard Resistor	A
23-12-1991	Mr. B. A. Addas	The Smith Chart	A

Date	Lecturer	Title	language
8-1-1992	Dr. Yamanochi	30 Minutes forum: uncertainty(8), various sources of uncertainty	E
8-1-1992	Dr. M. Aghbar	Measurements results	A
15-1-1992	Mr. M. K. Haj-Ebrahim	RF Power measurement	A
16-2-1992	Mr. E. Salhani	Calibration method of decade resistance box type 2793-01 2793-03 by using wheatstone Bridge 2768	A
4-3-1992	Dr. M. Aghbar	Frequency/Time coordination	E
9-3-1992	Mr. A. Manaa	Comparison and dissemination Computers and information technology	A
15-3-1992	Mr. H. Bastati	A general study about IBM. PC	A
22-4-1992	M. A.S. Karouni	The transportable reference "Zener dioele" DC. voltage standard	E
28-6-1992	Dr. M. Aghbar	"Conference on precision electromagnetic measurements"	E

ANNEX 13

ARAB SCHOOL OF SCIENCE & TECHNOLOGY

Forum on

STATE OF METROLOGY IN SYRIA

Sponsored by

Scientific Studies & Research Center (Syria)

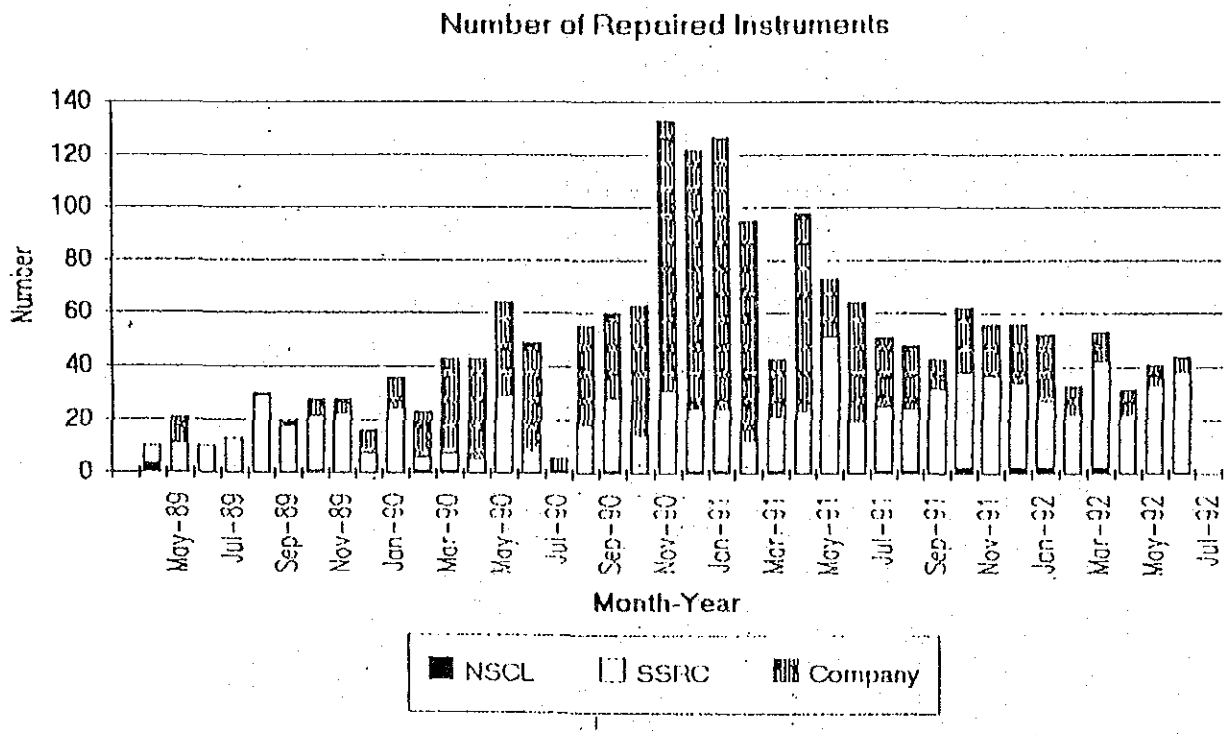
June 1 - 2 , 1992
Higher Institute for Applied Science & Technology
Damascus , Syria

Scedule of Forum : State of Metrology in Sytian Arab Republic

Monday 1 / 6 / 1992			Tuseday 2 / 6 / 1992		
TIME	SUBJECT	LECTURER	TIME	SUBJECT	LECTURER
9:00- 9:30	Registration and opening		9:00-9:45	Role of the university in showing the	Dr. A. A. Avar
9:30-10:15	Metrological legalities and the role of	Mr. A. Hadid		measurements necessity, quality control,	FMEE*
	SASMO	SASMO*		and prepairing the qualified engineers	
10:15-11:00	State of monitoring the legal instruments	Dr. A. A. Baroudi			
	in Syria	Ministry of Provisions	9:45-10:30	Quality controll in production	Mr. Z. Salhani
11:00-11:30	Brack				SSRC*
11:30-12:15	Metrological system according to the	Mr. G. Alabed	10:30-11:00	Break	
	traceability of standards	ITRC*	11:00-11:45	Role of the national standards in quality	Dr. M. Aghbar
12:15-13:30	Visit the NSCL			assurance of production	NSCL*
13:30-15:00	Lunch		11:45-12:30	Japanese Measurement Law	Dr. Yamanouchi
15:00-15:45	The metrological laboratory existing in	Dr. Z. S. Soulaiman	12:30-13:15	The role of JEMIC	Mr. Hatakeyama
	Syria and the ability of supporting them to		13:15-14:30	Lunch	
	built the complementary metrological		14:30-16:30	Round table (Discussion)	
	system		16:30-17:00	Conclusion	
15:45-16:30	State of radiation standards in Syria	Dr. T. Yasiin			
		AEO*			

* SASMO: Syrian Arab Standardization and Metrology Organization
ITRC: Industrial Testing and Research Center
AEA: Atomic Energy Agency
FMEE: Faculty of Mechanical and Electrical Engineering

ANNEX 14


Number of Repaired Instruments
Number
140
120
100
80
60
40
20
0
May-89
Jul-89
Sep-89
Nov-89
Jan-90
Mar-90
May-90
Jul-90
Sep-90
Nov-90
Jan-91
Mar-91
May-91
Jul-91
Sep-91
Nov-91
Jan-92
Mar-92
May-92
Jul-92
Month-Year
NSCL
SSRC
Company

1992. 7.

Annex 15 Applied Research and Development Activities : Dr. Aghbar

NSCL began applied research and development activities which is the only mean to sustain our technical level compared to the progress and need of public and private companies.

We aim at designing new products or developing some existing designs, in order to stimulate local industry as well as to provide some calibration laboratories with adequate standards in addition locally made, which would thus be easier to obtain and cheaper.

Some of those works could also be considered, in our opinion to being suitable for collaboration with metrological laboratories such as (JEMIC, ETL, PTB, LCIE, NPL).

In the following subparagraghs we are briefly presenting those works.

VII-6-1- Saturated Standard Cell :

The second generation prototypes are made using platinum leads. The mean value measured between 11-8-1991 to 30-6-1992 , of one sample, at local temperature (23 ± 1)°C is :

1.018913 V ± 26 μ V

The stability of this sample between 5-5-1992 to 30-6-1992 is 14 μ V.

The third generation prototypes are using cadmium sulfate (purity 80%). The unstability during fifteen days, of one sample is ± 32 μ V , showing that we have surely to use pure cadmium sulfate (95 %).

VII-6-2- Decade Resistors :

A new decade resistor based on the design proposed by CPEM 88, is made. Its design is based on a minimum number of resistance elements connected in series and having nominal values R, 2R and 3R.

The first prototype is made using high stability metal film resistors and it consists of 4 decades, x 10 ohm, 100 ohm, 1k ohm, 10 k ohm.

The stability of this decade resistor, during one year, is within 0.01% .

The second generation (6 decades resistor) will use Alpha electronic precision resistors to achieve 0.01%; 0.1%, 0.5%.

VII-6-3- Standard Resistors :

NSCL made standard resistors using high stability thin film resistors manufactured by Alpha Electronic LTD and Vishay company. The nominal values of those standard resistors are 1kΩ , 10kΩ, 100kΩ , each of which consists of four resistors connected in serial parallel between the two

potential terminals (P.T.). The current terminals (C.T.) are connected to the (P.T.) by using a copper plate. The zero resistance value between (C.T.) and (P.T.) is Ro= 0.5 m Ω.

Table(8) gives the results of measurements conducted during one year.

Table(8) : Measurements results

Nominal value	Mean value	Standard deviation
1kΩ*	0.999974kΩ	4mΩ
1kΩ	0.999970kΩ	2mΩ
10kΩ	9.99963kΩ	0.03 Ω
100kΩ	99.9954kΩ	0.4Ω

* Vishay elements

VII-6-4- The Transfer Standard:

The role of the transfer standard is extremely important in the field of resistance measurement, in calibration of ratio of measuring instruments, and in resistance scaling.

The thin film high precision resistors "Hermetic" which are manufactured by Alpha Electronic LTD. have been used to build up 1kΩ step, 10kΩ step and 100kΩ step, transfer standards. The 11 high precision resistors are connected in series using the copper plate leads and shorting leads, so as to achieveΣ Ri. The 11 resistors can be connected in parallel by using two shorting bars of copper plate, so as to achieve
R parallel = (Σ 1/Ri).

Those three prototypes of transfer standards have been calibrated for 9 months, and the result of their stabilities are shown in the table below;