PRESIDENT'S MESSAGE – THE YEAR'S ASSESSMENT

I, certainly as well as other NCSL past presidents, during the waning days of their administration, have reflected on the year's activities. We perform this private act in hopes of finding some outstanding achievement the organization has accomplished. Few of us have found any, because the character of the NCSL is one of continuous progress in its programs. Those programs become successful because of the dedication of the participants, the "nose-to-the-grindstone" philosophy, the wide information awareness provided to the membership and the ability to often respond to influence the conditions that govern our measurement community. Considering that service in the NCSL activities is voluntary, the organization's accomplishments have been excellent.

One particular committee, this past year, has done an outstanding job in establishing programs and developing others that will be implemented in the near future. Additionally, that committee was recognized as being critical to the NCSL because many of our members voiced, over several years, concern over the lack of resources and the impact they were experiencing. I salute the Education & Training Committee for its involvement in the varied areas where educational needs could be developed and effectively provided to the membership.

I do not wish to downplay this year's activities of the other NCSL standing committees, for they also have programs that will have future impact on our laboratory services. The respective Committee Chairmen have accurately assessed the user requirements and are well into the stages of implementing programs to achieve their objective.

The Regional Coordinators continue to conduct successful meetings. The increased mixture of educational, technical and administrative regional meetings has provided the catalyst for increased membership awareness and participation. These meetings must remain the primary source of feedback of membership concerns.

I wish to thank the membership for providing me the opportunity to serve as president of this distinguished organization. The experience received, both as an NCSL delegate and officer, is invaluable. The ability to openly communicate with other laboratory managers, the opportunity to participate with the NBS executive management and the experience of just meeting the wide spectrum of metrology technical and management personnel has provided personal and professional growth.

My gratitude to the NCSL Board of Directors for their individual support. The personal friendship and professional respect experienced will endure for many years. I leave the office saddened; but relieved from the burden of office and knowledgeable that the organization is financially healthy, dedicated to mission and will remain successful under the competency of the incoming administration.

J.A. Valentino
NCSL President
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1981 NCSL MANAGEMENT ROSTER
THE ELECTION RETURNS ARE IN AND HERE ARE THE RESULTS

PRESIDENT	John Lee	U.S. Instrument Rentals
EXEC. VICE PRESIDENT	*Dean Brungart	Teledyne Systems Co.
VICE-PRESIDENTS	Dennis Gallagher	Leeds & Northrup
*Hartwell Keith	Ford Aerospace
*Doug Doi	Lockheed California Co.
*Cliff Koop	Rockwell Collins
DIRECTORS	*Chuck Corbridge	Tektronix
*Moe Corrigan	Lockheed Electronics
*George Rice	Rockwell Intl.
*Hugh Starling	General Electric Co.
*Bob Weber	Lockheed Missile Co.
TREASURER	Bob Delapp	SRI
SECRETARY	*Selwyn Smith	RCA

*1980 Election

EDITOR'S MESSAGE

Error in June 80 Newsletter

Sharp-eyed Ralph Barger of EGG, Las Vegas picked up a page misposition in Rolf Schumacher's article in the June 80 Newsletter. The problem is solved by simply reading page 17 BETWEEN pages 13 and 14. Sorry for the slipup and any reader confusion it might have caused.

NBS/NCSL Boulder Secretariat Telephones Change

NBS Boulder Labs now have a Direct Dial-in Telephone Exchange Numbers for key NCSL people are:

Bascom W. Birmingham	(303) 497-3237
L. Kenneth Armstrong	(303) 497-3787
Helen Valdez	(303) 497-5506
HIGHLIGHTS OF THE NCSL BOARD OF DIRECTOR'S MEETING
July 17 & 18, 1980
Falmouth, Massachusetts

PRESIDENT'S REPORT

Status of MIL-STD-45662

Jim Valentino reported on a recent telecon with Mr. Del Burchfield regarding the revision status of MIL-C-45662A. Mr. Burchfield stated that the document was in printing and would be released as MIL-STD-45662. Major changes were in the area of E.D.P. recall, accuracy ratio and out-of-tolerance feedback; and that the subject document is an agreement worked out between industry and the Army, the document's proponent. Jim will invite Mr. Burchfield or a representative to participate in the upcoming 1980 NCSL Conference Workshop.

The consensus of the Board indicated that Rolf Schumacher's informative report of April 22, 1980 regarding the standard, provided the Board and NCSL membership with an accurate account of its current status. It is in NCSL's charter to disseminate information to the membership regarding any changes or forthcoming changes in DOD specification or standards which will have a direct impact on its company. Jim stated that when DOD officially releases MIL-STD-45662, he will complete his action by mailing a copy to the NCSL membership.

EXECUTIVE VICE PRESIDENT'S REPORT

John reported on his action concerning accepting membership as it relates to more than one member delegate from the same organization at the same address. John reviewed and found the "Guidelines for Membership Acceptance" satisfactory and recommends they not be changed.

"Change Sheets" incorporating the approved changes to the NCSL "Long Range Plan," and the "Long Range Plan Supplement," have been forwarded to the Secretariat with instructions to publish and distribute them to the membership.

January 1981 Board of Directors Meeting - This meeting has been scheduled for January 28 and 29, 1981 aboard the Queen Mary, in Long Beach, California. The January meeting has been scheduled in this time frame to give Board members more for their travel dollar by giving them an opportunity to attend the Region B meeting on January 27, 1980, which is also aboard the Queen Mary and also attend the Measurement Science Conference scheduled for January 30 and 31, 1981 in Anaheim, California.

Past President's Report

Ron Kidd reported that the 1980 Wildhack Advisory Panel had made their selection, and this year's recipient would be announced at the September NCSL Conference.

Secretary's Report

Doug Doi reported that since the April Board Meeting, NCSL has welcomed seventeen (17) new member delegates.

Doug recommended a change to "Guidelines for Membership Acceptance" as follows:

- The Secretariat will be mailing the original membership application to the Secretary for approval, not a copy.
- The distribution for the Welcome Letter was expanded.
- All mention of the Membership Chairman has been deleted.
- Copies of the Secretariat deposit slips will no longer be sent to the Secretary.

A motion was made and seconded to accept the proposed changes to the "Guidelines for Membership Acceptance" as presented by Doug Doi. Motion passed.

TREASURER'S REPORT

Jeff Valenti reported that due to a job change within the Treasurer's organization, Bob DeLapp will not be able to fulfill the second year of a two-year commitment starting from October, 1979. Since the 1980 ballots have already been mailed, Jim stated that he would appoint a replacement, with concurrence of the Executive Committee.

REPORT OF VICE PRESIDENT - ADMINISTRATION

Meetings and Programs Committee - Chairman Mike Suraci, also the 1981 Conference Co-Chairman, discussed the potential conference sites at Boulder which is scheduled in October, 1981.

Mike Suraci took an action item to contact the director's of those regions who have not as yet provided plans and schedules of regional meetings.
Honors and Awards Committee - Chairman Bob Lady reported that as part of a previous action, the alloy type NCSC lapel pins which he has ordered (400 each) will be available soon.

A motion was made and seconded to sell the alloy lapel pins to the NCSC membership at cost ($3.00 each). Motion passed.

The Board recommended that an article publicising the availability of the lapel pins be entered in the next Newsletter. Additionally, a lapel pin display will also be posted at the 1981 Conference registration table.

The action item to procure a suitable plaque for NBS Boulder's 25th Anniversary is progressing slower than anticipated and should be completed by the next Board Meeting.

On behalf of the Board and membership, Bob Lady presented Jim Valentino with his Presidential "Gavel-of-Office" plaque award which can be used or hung in his office.

Education and Training Committee - Chairman Bryan Werner reported that a strong subcommittee structure is being developed to handle the many tasks this committee has assumed.

Adjunct Training - This subcommittee is in the process of packaging the first one-day course, in writing guidelines for course presentations and in developing subsequent courses.

Curriculum Development and Coordination - This subcommittee will work with educational institutions (Texas A&M and Community College of Pittsburgh) in the process of developing metrology programs, and will liaison with ASQC, NBS, Metron and others who have been involved in training in metrology or closely related fields.

NCSC Training Aids Library - In response to his action item, Jim Valentino reported that the long sought after solution of maintaining the NCSC Training Aids had finally been resolved. Milt Towne of Sanders will continue to review the video tapes to determine which tapes can be used as masters and what additional masters are needed. Based upon Ken Armstrong's historical loan records, an appropriate number of copies will be reproduced from the masters. The library consisting of all masters and copies will then be shipped to the Secretariat at NBS Boulder for subsequent maintenance and distribution to the membership.

Bryan Werner took an action item to develop a policy on how to handle training aids which are not returned to the Secretariat.

Regional Coordination - The Regional Training Coordinator will be tied together through one committee member. This network will be used to search out information on training supplies and opportunities already available, and transmit this back into the appropriate subcommittees. Coordinators will also be used to facilitate presentation of adjunct training courses, and discussion-type surveys at the regional level. Bryan stated that they still needed regional training coordinators for regions 2 through 7.

Training Aides Catalog and Listings - An update of the NCSC Course Register is being worked on, with the addition of new courses, books and videotapes.

Public Relations - This group will look at the needs and means of projecting a better image of metrology to the public, to management, and to high school students considering career paths.

Bascom Birmingham informed the Board of a new 12 minute film produced by the Bureau entitled, "Taking America's Measure." The Board recommended that this film be shown at the next Board meeting.

An action item was given to Dean Brungart to ask Jerry Hayes for a copy of the film "Why Calibrate" for inclusion in the NCSC Training Aid Library.

Bascom informed the Board about a program at NBS Boulder involving about 30 of their scientists who have gone out to both junior and senior high schools in Boulder Valley. The scientists discussed measurement problems involved with such topics as lasers and cryogenics. Motivation goals were not so much training, but to stimulate interest in science during the development years before a student has selected a college or career path.

The Board agreed upon the importance of such programs and gave Bryan an action item to enter an article in the Newsletter to stimulate NCSC members to get involved with programs of this type.

1980 NCSC Conference - Seven panelists have been lined up for the Education and Training Workshops.

Policy on Remuneration or Compensation for Lecturers - Bryan presented a draft to the Board on a policy to define conflict of interest and provide guidelines to govern reimbursement of personal expenses to an individual/organization for performing a service to NCSC. These services would be negotiated for when such services cannot be obtained on a strictly voluntary basis. This would enable NCSC to obtain these needed services...
services which would otherwise not be available. The Board discussed some of the alternatives regarding the charter of the Education and Training Committee. Should NCSL disseminate the availability of existing training courses to the membership or develop and provide training courses or both?

After a lengthy discussion the consensus of the Board indicated that once the Committee has established a need and an audience for a particular training course, which is not currently available, the committee may proceed to negotiate for these services on a self-liquidating basis. Since these NCSL training courses would be attended by both NCSL and non-NCSL members, it was suggested that a distinction be made in the course registration fee.

REPORT OF VICE PRESIDENT - COMMUNICATIONS AND MARKETING

Vice President Dean Brungart reported that regions 1, 3, 4 and 8 had responded to his request to screen the NBS mailing list for potential members in their regions. He has also mailed membership brochures and Jim Valentino's letter to each of the potential members. Recent gains in the organization's membership is also attributed to the outstanding promotional work by Brian Belanger and the efforts of Regional Coordinators.

Newsletter - In the absence of Editor John Minick, Dean reported that the first sought after second class mailing permit had finally been approved. The June issue of the Newsletter was mailed on the 11th of July. Good news, John has agreed to stay on as Editor for another year.

Information and Director - In the absence of Chairman Jim Gilbert, Dean reported that Jim is working on publishing RP-3 and RP-5. He will be starting to put together the NCSL Laboratory Director by the September Board meeting. Dean stated he is still looking for a replacement for Jim for the next fiscal year and asked for suggestions.

REPORT OF VICE PRESIDENT - MEASUREMENT REQUIREMENTS

National Measurement Requirements Committee - In the absence of Chairman Frank Flynn, Dennis reported on a notice Frank had sent to the membership. The notice included the NBS response to specific criticisms in some of the problem measurement areas identified by the NCSL membership in the 1978 National Measurement Requirements Committee survey. Dennis also mentioned that included in Frank's mailing was a "Requirements Identification" form for those members who still have measurement problems or foresee problems and require more information. Completion and return of this form has been extremely poor, so Frank requests that those members who intend to respond do so immediately.

Laboratory Evaluation Committee - In the absence of Chairman Clem Malot, Dennis presented his report on an AAJMA document entitled "Standard Recommended Practice for Evaluation and Accreditation of Agencies or Laboratories Performing Electrical Tests or Inspection or Both," which is being studied by ASTM Committee E-35. Dennis stated that with AAJMA pushing for programs of this type, the possible impact on the NCSL membership calls for greater NCSL involvement in its development.

Dennis urged the Board to read and study the 1 June and 1 April issue of the TMQ Update (distributed to the Board by Clem Malot) dealing with Product Certification - Laboratory Accreditation.

NVLAP - Current status on Bruno Weinschel's request for development of an accreditation program in electromagnetic calibration indicates that after receiving some requested changes, a "preliminary finding of need" will be published for comment in the Federal Register in August. The opinion coming in appears to indicate that the Department of Commerce is not ready at this time for considering a comprehensive calibration lab accreditation program. However, they most likely will go ahead with the specific request and publish the preliminary finding of need for a lab accreditation program in electromagnetic calibration services.

EDITOR'S NOTE: The Federal Register notice appeared on Wednesday, August 6, 1980, pages 52326-52329.

The Office of Management and Budget (OMB), Circular A-119, issued on January 17, 1980, entitled "Federal Participation in the Development and Use of Voluntary Standards" - This circular establishes policy guidance governing executive branch participation in voluntary standards activities and encourages the use of acceptable voluntary standards in the federal procurement process.

An action item was given to Bascom Birmingham and Brian Belanger to review OMB Circular A-119 and the Department of Commerce's proposed procedures for the listing of voluntary standards bodies.

Biomedical and Pharmaceutical Committee - Chairman Geron Smith reported that his action item to prepare a biomedical questionnaire has been withdrawn. The original intention of the questionnaire was to establish guidelines for any accreditation program of metrologists involved in the biomedical and pharmaceutical industries. Since the NCSL is presently not constituted to operate an accreditation program, further action would not be productive.

Reference Standards and Standardization Methods for Solution Conductivity - Geron reports that his committee has identified the
following recommended methods dealing with this subject:

- American Public Health Association, Standard Methods for the Examination of Water and Wastewater, 14th Ed., 1975
- National Committee for Clinical Laboratory Standards, tentative standard TSC-3.
- OIML International Recommendation (draft) August 1978

The standardization of electrolytic sensors and equipment will be a subject for discussion and recommended action at the September Committee meeting. Another item for the meeting will be the new FDA regulation concerning procedure for performance standard development, and voluntary standards development and policy, published in the Federal Register; Vol. 43, No. 23, 2-1-80.

REPORT OF VICE PRESIDENT - LABORATORY MANAGEMENT AND OPERATIONS

Calibration Systems Management Committee - Chairman Bob Guibord reported that the salary questionnaire originally scheduled for distribution in May will now be conducted in September.

Interval Analysis - Ground work has been initiated on the survey and Bob stated he has obtained a copy of a previous NCSL survey called "Melt the Ice" and also a copy of a survey conducted by the government. Bob asked the Board for suggestion, information and assistance on what they would like to see in the survey. The survey should be ready for distribution in late 1980 or early 1981. Brian Belanger took an action item to get a copy of the Raytheon Survey to Bob as soon as it becomes available.

Measurement Assurance Committee - As part of a previous action item, Chairman Gary Davidson reported that Gage Block Group MAP is on its way, largely due to the efforts of Jack Edison, Laurel Auxier and Brian Belanger. NBS has agreed to provide the first gage block group MAP on a pilot basis. The fee for participation, on a one-time basis, will be $1,000. Data for the first phase is due to NBS the first part of August. Initial participants are:

- Beckman
- Navy
- TRW
- Air Force
- COMTEL
- Ford Aerospace
- Duke Power
- Lockheed-Sunnyvale

Voltage Group MAPs - Phase I experiment for the Northern California and second Southern California group is completed. The Phase II experiment will start for both groups in August-September time frame.

Automated Test and Calibration Systems Committee - Chairman Pete England reported on the NKC Workshop on automatic test equipment held earlier this year under the sponsorship of the Evaluation Panels for NBS. The meetings for fiscal year 1980 were concluded in May and the reports are being edited prior to the final printing. The report of the workshop will be included in the volume entitled, "An Evaluation Report on the National Engineering Laboratory, National Bureau of Standards, Fiscal Year 1980."

Pete has received information from Oscars Peterson of NBS, suggesting that this ATE sub-panel may continue to meet in order to provide timely inputs to the project. The same correspondence requested comments on some preliminary conceptual designs of the bureau's proposed dynamic transport standards (DTS) for ATE.

Desktop Calculator Exchange Program - Pete stated that he had not received any new submittals during the past quarter, and had received only six (6) requests for exchanges.

Conference Workshop - Workshop format includes a brief introduction, possibly a short film, a review of NBS proposals for metrology support of ATE (Barry Bell) and a short presentation on calibration philosophy for the U.S. Army ATE. All attendees will then be divided into three groups:

- (Technical) Calibration Concepts for GSE/TMDE
- (Technical) Calibration Concepts for Standards
- (Administrative/Procedures) Specifications, guidelines, management, etc.

Product Design Specification Committee - In the absence of Chairman Dexter Franke, Moe Corrigan presented his written report. The PDS Committee has thus far been concerned with coordinating the acceptance of the past year's recommended practices submitted by the PDS Committee to the RP Committee.

Dexter reported that his committee is presently dealing with loose terminology with regard to automatic test systems and some of the newer microprocessor based test equipment. He has sent a questionnaire to his committee members asking for ideas on how this task should be addressed. Moe stated that due to the poor response to the questionnaire, he would like the Board to respond.
LIAISON REPORTS

OIML - Brian Belanger reported that a large International OIML conference was held at Washington, D.C., in June. Several foreign attendees from the weights and measure community showed an interest in NCSL. Brian also mentioned that if any of the Board members were interested in getting involved with OIML activities, he would be more than happy to add their names to the committee.

GIDEP - Liaison Delegate Chuck Corbridge reported that the next annual GIDEP workshop will be held at Niagara Falls, Canada, on October 21-23, 1980.

Measurement Science Conference (MSC) - Liaison Delegate Dean Brungart reported that the plans for the January 30, 31, 1981 conference is progressing smoothly. Luncheon speakers will be Fred Hume of John Fluke Mfg., Co., and Bruno Weinschel, President of Weinschel Engineering. PMA is having a one-day training symposium on Thursday, January 29, presented by Metron Corporation. The MSC Incorporation is progressing rapidly.

ASTM - Liaison Delegate Ron Kidd reported that Dennis Gallagher would be attending the next E36 committee meeting in October. Ron also stated that he had encouraged Clem Maiot to join ASTM to become more involved with their laboratory accreditation activities.

SECRETARIAT’S REPORT

Reproduced and mailed the following: 1980-81 Slate of Nominees to all members; Frank Flynn’s NBS Requirements Identification Survey; 400 NCSL Brochures to Brian Belanger.

Capabilities Questionnaires are still coming in. Data will be entered into the computer by July 18, 1980. Ken reported that he had Newsletters in the file dating back to June 15, 1968. An action item was given to all directors and regional coordinators to urge the membership to mail in the ballots for the 1980-81 Slate of Nominees as soon as possible.

SPONSOR’S DELEGATE

Second International Conference on Precision Measurements and Fundamental Constants - Bascom Birmingham provided the Board with background information on a letter from Dr. Barry Taylor of the Bureau to Jim Valentino, seeking financial support for the 1981 Conference. Financial support will be used by the Conference Committee on an as needed basis to help subsidize the transportation or subsistence of noted people from abroad, primarily from the universities. A motion was then made to donate $1,500. Motion passed.

An action item was also given to John Lee to announce at the 1980 Conference Member Delegates Meeting that NCSL is supporting the conference.

Bascom informed the Board about a trip he and Dr. Ambler had taken to the People's Republic of China in May. He indicated that in a meeting with the Chinese Director of the National Institute of Metrology, he had expressed an interest in the NCSL organization. As a result of that meeting, Bascom prepared a letter to the director for Jim Valentino's signature.

NBS CALIBRATION AND ASSOCIATED MEASUREMENT SERVICES

Due to the recent concerns by the Bureau on their calibration services, Bascom Birmingham reported that Dr. Ambler had established a task force within NBS, on Calibration and Associated Measurement Services. Bascom then presented an interim report on the task force activities to the Board, and asked Jim Valentino to convey the Board's comments to Dr. Bob Kamper within the next week.

Jim Valentino took an action item to call Dr. Kamper regarding the Board's comments on the NBS task force interim report, and also informed the Board regarding his telecon with Kamper. During the discussion of the interim report, some members of the Board felt that NCSL should have more involvement in the technical arena. Chuck Corbridge took an action item to present to the Board by the January Board meeting on an outline of his recommended direction changes.

REGIONAL REPORTS

Region 1 - Regional Coordinator Harry Haymes reported there are now 33 members in Region 1. No meetings were held during the last quarter but one is scheduled on July 30, 1980, at Draper Laboratories in Boston. Main topics will be: plan for the next year, MIL-STD-45662, and a voltage MAP program. A discussion on reasons why some East Coast regions had not entered into the voltage MAPs seemed to be for various reasons:

- Cost of the MAP Program
- Close proximity to the Bureau
- Availability of other reliable sources for calibration of standard cells
- No real urgent technical need for the MAP.

The fall meeting will be held at Microwave Associates in Burlington, MA. Harry reported that at their last regional meeting there was very little interest in pure metrology-type training courses. There was, however, a strong interest in microprocessor type courses.
Region 2 - Regional Coordinator Selwyn Smith reported that they had held one meeting (with nine in attendance) at Leeds & Northrup since the last Board meeting. Primary topic was mercury vapor contamination. The next meeting is scheduled for October, 1980. With Selwyn slated to take office as NCSL Secretary, they are looking for a new regional coordinator.

Region 3 - In the absence of Regional Coordinator Fred Kern, George Rice presented the report. The first meeting of the year (with 14 in attendance) was held May 16, 1980, held at and hosted by Jim Gilbert of Virco Laboratories, Silver Springs, MD. Main topics were: MIL-STD-45662, ATE and automatic calibration training, MAPS, and metrical training. A recent regional survey indicates an interest in the following areas: calibration system management, calibration techniques, error analysis, training, MAPS and automatic calibration systems.

Region 4 - In the absence of Regional Coordinator John Riley, Bob Weiler reported that the last regional meeting was held on April 29th at Kennedy Space Center, Florida. Major topics centered around education and training programs, MAPS, MIL-STD-45662, and metrical training. Mr. Robert W. Schmepf, RCA, has agreed to act as the Regional Training Coordinator.

Region 5 - In the absence of Regional Coordinator Joe Katoch, Cliff Koop reported that a meeting was held on June 24th and hosted by Geon Smith at Yellow Springs Instrument Co., Yellow Springs, Ohio. Topics centered around GMP, GLP and standards of conductivity measurements. Joe has mailed out a MAP questionnaire and has received a few responses.

The next regional meeting is scheduled at the upcoming September conference.

Region 6 - Cliff Koop reported that the last regional meeting was held on May 29th, held and hosted by Pat Morison at Tektronix in Dallas, Texas. Topics centered around MIL-STD-45662, and MAPS. The next meeting is scheduled in Austin, Texas, on September 4th, to be hosted by Rhodes-Groos Laboratories, Inc.

Region 7 - In the absence of Regional Coordinator Barry Doolittle, Bob Weiler reported that the last regional meeting hosted by Hewlett-Packard, Palo Alto, California, was well attended. Meeting was attended by Barry Bell of NBS, who gave an interesting presentation on ATE traceability. David Ricci of HP gave a presentation on IEEE instrumentation and trends of the future. Other topics included microprocessor training, MAPS, laser technology, and MIL-STD-45662.

Region 8 - In the absence of Regional Coordinator Rolf Schumacher, Hartwell Keith reported that he has spent considerable time following-up on the regional delinquent members. The next meeting is scheduled for October 22nd aboard the Queen Mary. The January regional meeting is scheduled for the 27th on board the Queen Mary, the day before the NCSL Board Meeting.

International Region - In the absence of Regional Coordinator Graham Cameron, George Rice reported that an "international luncheon" is scheduled for Monday noon, September 22 at the conference. A workshop/regional meeting is also scheduled on Thursday (September 25th; 11:00-1:30). The meeting will feature the NCSL slide presentation, presenting of new NCSL lapel pins, and discussion of selected topics. Dr. Kurt Heinrich, Chief, NBS Office of International Relations, has agreed to attend both international functions.

Brian Belanger indicated that thus far, 15 individuals from the international sector have indicated they intend to attend the conference. These attendees will have specially identified name tags, so they can be recognized and welcomed by the NCSL membership.

Ken Armstrong reported that as of July 15 the total paid NCSL membership was 422, with 31 unpaid members. John Lee admonished the directors and regional coordinators to get the new members involved and "put-them-to-work." The Board agreed that an information sheet, such as the "Fact Sheet" being developed by Dennis for the 1980 Conference, will be ideal for the Secretary to enclose along with the welcome letter being sent to new members.

1981 Board Meetings - John announced that the January meeting, as previously reported, will be on the Queen Mary at Long Beach, California, on January 28 and 29. The April and July meetings are scheduled for the south and midwest. Those having any preferences were asked to contact John.

NBS "MAP Handbook" - Brian Belanger reported that the second edition draft of the MAP handbook was presently in editorial review at the Bureau. This draft has fairly extensive revisions relative to the first draft.

ATTENDEES:
J. A. Valentino - President - Sanders Assoc. Inc.
J. Lee - Exec. Vice President - U.S. Instrument Rentals
D. A. Brungart - Vice President - Teledyne Syst. Co.
M. J. Corrigan, Jr. - Vice President - Lockheed Electronics Co.
D. H. Gallagher - Vice President - Leeds and Northrup Co.
H. C. Stirling - Vice President - General Electric Co.
Board Meeting

D. M. Doi - Secretary - Lockheed-California Co.
B. W. Birmingham - Sponsor's Delegate
National Bureau of Standards
C. N. Corbridge - Director - Tektronix, Inc.
H. C. Keith - Director - Ford Aerospace &
Commun. Corp.
C. D. Koop - Director - Rockwell International
G. Rice - Director - Rockwell International
R. Weber - Director - Lockheed Missiles &
Space Co.
R. E. Kidd - Past President - Microwave Assoc.
L. K. Armstrong - NCSL Secretariat - National
Bureau of Standards
B. Belanger - Liaison - National Bureau of
Standards
G. Davidson - Committee Chairman - TRW/DSSG
R. M. Lady - Committee Chairman - Lockheed
Georgia Co.
R. Guibord - Committee Chairman - TRW/DSSG
H. B. Werner - Committee Chairman - Westinghouse Electric Corp.
J. M. Suraci - Committee Chairman - Lockheed
Missiles & Space Co.
R. B. England - Committee Chairman - General
Dynamics
G. Smith - Committee Chairman - Yellow Springs
Instrument Co.
H. D. Haynes - Regional Coordinator (1)
Sanders Assoc., Inc.
S. P. Smith - Regional Coordinator (2) - RCA
P. J. Grooss - Regional Coordinator (6)
Rhodes-Grooss Lab., Inc.

George Ploce, Ron Kidd & Cliff Koop are probably com-
menting on Denzys Gallagher's (R) bright red shirt &
yellow straw hat. Looks like Ron's last meeting lost
its dress code.

Now Corrigan, Gary Davidson, Hugh Starling, Bob Lady,
Bryan Werner, Richard Keith, Chuck Corbridge, getting
ready for meeting to resume.

Bob Guibord, Cliff Koop, B. W. Birmingham, Ken Arm-
strong, Now Corrigan, Gary Davidson.
### NCSC Treasurer's Report

**Fiscal Year 1979-80, Third Quarter**

1 April 1980 thru 30 June 1980

#### Expenses Budget

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Total Committee Accounts $18,600.00

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Total Operation Expenses $9,500.00

#### Totals $28,100.00

### 3rd Quarter Balances

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WHO ARE WE?

SURVEY OF NCSL MEMBERSHIP AND ORGANIZATION SUMMARY

Shown below is a summary of the "Survey of N.C.S.L. Member Organizations" conducted in conjunction with the 1980 dues invoicing. Only 236 delegates responded, and of those, 13 had to be excluded either because the form was returned with incomplete data or questions were misinterpreted.

The percentage shown under "Organizations Responding" reflects the primary product or interest category compared to the total number of organizations responding. For example, "computer and related equipment" respondents make up 2.7% of the total responses.

All other percentages are calculated horizontally and are derived from the number in each classification compared to the total number of people involved in standards and calibration activities for a category. For example, out of 318 persons involved in computer and related equipment, 12% are managers. The totals line percentages represent the classification breakdown averages of all respondents, and presents a comparison of each category's staffing to the averages of all respondents.

As might be expected, aerospace and undersea support organizations have the largest number of people engaged in standards and calibration activities, the highest number and percentage of technicians, and one of the lowest percentages of management personnel. Communications equipment and systems (26%), R&D organizations (25%), and government (23%) have the highest percentage of engineers involved in standards and calibration activities.

The total number of people represented by the 23 organizations is 584,326, or an average of 2620 per organization.

SURVEY OF NCSL MEMBERSHIP ORGANIZATIONS SUMMARY

<table>
<thead>
<tr>
<th>Primary Product Line or Interest</th>
<th>Organizations Responding</th>
<th>Number of Persons Involved in Standards and/or Calibration Activities within the Organization</th>
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<td>Components and Subassemblies</td>
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5/15/80
March 19, 1980
GMC Division
Pontiac, MI
Joe Katoh
Region 5 Coordinator

The meeting was called to order at 9:07 A.M. with an informal introduction of the attendees and the companies they represent. Welcoming remarks were given by host Larry Royce of the GMC Truck and Coach Division. The first order of business was an overview of the January Board of Directors meeting. The increased duration of the 1980 conference was well received by all that were in attendance with a consensus that it should make a very meaningful and informative interchange of information. In compliance with the request from the B.O.D. as to what we are doing as companies in the way of metric conversion, the following comments were submitted:

1. Conversion is dependent on many factors and each or a combination of these must be weighed and examined very carefully. Number of product lines to convert versus the total number of product lines manufactured. Number of manufacturing facilities for the same product lines, or using the same parts in different product lines. Availability of outside job shops capable of producing machined parts in the metric system in your locality at competitive prices. Jobbers with sufficient stock to support your manufacturing operation as drill bits, taps, reamers, fasteners, etc.

2. Willingness of your management to allocate and approve the expenditure of monies for both capital and expense to implement the system. Time and materials for training with ample time to come up to speed. Time to draft, set and implement policies and procedures and standards for manufacturing and its support areas, as Engineering, Purchasing and Quality Assurance. Last but not least, the Packaging and Shipping Department.

The discussion shifted to the revision of MIL-C-45662A and its cost impact on goods or services produced. One point that was brought out in the early part of the discussion was that the change would not be retroactive to contracts now in effect. However, it could be written in to MIL-Q-9858 with compliance to a requirement for new contracts. Being unaware of the change in MIL-C-45662 could have a large cost impact for companies not geared for this additional record keeping.

Another point was that of redundant instruments for testing as a means of compliance for this requirement. As a general rule, the people involved with calibration and inspection of finished products with any amount of precision or complexity are somewhat knowledgeable of the operation of that product and know what kind of numbers to expect. Any variance from this norm is reason enough for them to call for expert assistance to resolve their difficulties. The question is how to handle items such as printed circuit cards or modules that are produced as an end product. How does a company keep track of which units were tested on which test system, and when and where were they shipped? Are they part of another assembly or are they incorporated in a larger assembly and tested as a final product that is mass produced, or produced in very small quantities? High volume production of items such as P.C. boards or modules poses the problems of serialization and the tabulation of distribution. In the event a recall should become necessary.

With today's emphasis on working smarter not harder to meet these production requirements, automated testing has become a necessity rather than a luxury. ATE, while increasing output, has also increased the workload of the metrology community. It has become their responsibility not only to ensure its accuracy on a regular basis, but to verify its total operation. To achieve this goal a test program must be written to exercise the A.T.E. through a number of definite steps. What must be checked and what must not, to what accuracy and how often will be asked, but most important they must be answered. Who writes these programs? Do they know the answers to these questions? Do they care? If not, it is up to us, the metrology community, to make our inputs to them and the reasons behind our requests for these special tests that may or may not be programmed into production testing programs.

When a fail condition occurs, who has the responsibility and the knowledge to troubleshoot and repair these complex systems? What is required in the way of expertise, equipment, back-ups, to keep this complex, costly equipment on line with minimal cost?

Another point that was raised is how do we keep these highly skilled people on our payroll? These were some of the questions that were raised along with some suggestions but no definite answers. These questions will continue to be raised in the years ahead.

One suggestion that was presented and directed to the Education and Training Committee for possible consideration was to make engineering students aware of the vast and challenging fields of A.T.E. programming and maintenance coupled with training in metrology. At the last Measurement Science Conference the question was asked by Maynard L. "Is there a manual on good metrology practices in building test equipment?" The answer was "no".

-12-
The meeting then moved to the dining area for an excellent lunch and small talk ending with a very interesting and informative tour of the Truck and Coach Division of General Motors Corporation. The door prize of a metric conversion calculator was won by Gordon D. Main of Main Electronics. Larry Royce was also presented with a calculator for being the host. Eleven members attended.

Regional Coordinator John Riley reported that the April 29th meeting at Kennedy Space Center in Florida was very successful. Major emphasis of topics discussed at the meeting centered around education and training programs and regional MAP development. Other topics discussed included the proposed revision of MIL-C-45662 and metrolgy impact.

Mr. Robert W. Schneph, RCA, has agreed to act as the Region 4 Education and Training Representative.

There was some interest in a limited scope regional MAP for gage blocks. The objective would be to search for trouble areas, realizing that the requirements for a full scale certification program would not be met.

Carl Quinn discussed the regional MAP programs. Richard Press of Applied Technology reviewed methods used by ATI to measure and characterize laser power. He also presented an overview of laser technology and comparison of test methods.

Dave Ricci of HP traced some trends in instrument strategy using a series of slides showing the emergence of smart instruments and impact of microprocessors through the late 1970's. He then predicted future trends and probable results of IEEE-488-type systems.

Joseph Rothleder, Principle Metrologist of the State of California, gave a short review of the California measurement system and its relation to Weights and Measures work, NBS, and industrial labs.

After Vice President John Lee selected his own name out of the hat, the door prize, a classy briefcase, was awarded to Richard Press of ATI.

Attendees were welcomed to the HP facility by Rod Carlson, General Manager of the Stanford Park Division, and John Minck, HP's Member Delegate.

Bob Weber of Lockheed opened the meeting. A wide variety of topics were covered.

Carl Quinn reviewed the status of the consensus standard report (2-1). Bob Weber and R. Meredith led discussions on microprocessor training programs used by various members and advantages of coordinating with SB 132 retraining programs. Mission Community College programs were described.

Barry Bell of NBS presented a fine report on ATE/MAP relationships and how the Bureau is planning more engineering effort to support metrolgy requirements of automatic systems. A typical example is the concept of dynamic transportable standards which can be brought up to ATE systems to bring traceability and measurement assurance to the system.

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Attendees:
Aaron Priest
Chuck Corbridge
J. Francis Smith
W. L. Wilson
Carl Quinn
Dick Ratach
Chuck Docher
Thomas Whiteley
Daryl Autrey
Robert Lucera
Joseph Rothleder
John Cox
John Lee
Al Kohler
T. Roskivs
P. Haro
R. Press
L. R. DeLapp
D. Hansen

TRW/VIDAR
Tektronix
Northwest Cal Center
Fairchild
Simco
Intel
PGE
Ampex
Lawrence Labs
Lawrence Labs
State of California
Lockheed
U.S. Instrument Rental
Varian
IFM, Inc.
Ames
ATT
SRI
Dalmo-Victor
The following items were discussed during this meeting:

Item 1: The Boeing Aerospace letter to NBS created much interest because of similar problems in this region. It was felt that since problems of this type created such large ripple effects, NBS needs to address this problem as soon as possible.

Item 2: The MIL-C-45662A revision was read. All attendees want more information as soon as it becomes available. The more information on this subject the better.

Item 3: The Measurement Assurance Program was discussed in detail.

Region 6 now has five companies committed and all are ready to begin Phase I of the MAP. Rhodes-Groos Laboratories is in the process of coordinating the Phase I experiment.

The attendees all showed high interest in attending the National Conference in Gaithersburg, Maryland. More information will be appreciated when all details are known concerning this conference.

The next Region 6 meeting will be held in Austin, Texas, September 4, 1980. The host will be Rhodes-Groos Laboratories, Inc.

This meeting will be used to give MAP progress reports. Also, Austron, an Austin based company, has shown an interest in presenting a frequency seminar using Loran-C as the frequency reference.

Attendees:

John H. Pels
Harvey Evans
Pat Morison
Jim Bailey
Jim Cramer
Luke Smith
Bob Wade
Paul J. Groos

Austron, Inc.
Scientific Devices, Inc.
Tektronix
Metrology Specialists, Inc.
Texas Instruments, Inc.
E-Systems, Inc.
E-Systems, Inc.
Rhodes-Groos Laboratories, Inc.

The next discussion asked what we propose for adjunct training. The Temperature Seminar for the next meeting will be our first formal attempt at adjunct training. The members strongly proposed that only one subject be
taught. It is to be detailed with as much practical training as possible. Region 1 feels that to offer one course with many subjects is an injustice to the student. More than one hour per subject is required to adequately cover the material that should be presented.

Another survey will be sent to the members to hopefully resolve whether we feel training should be limited to basic measurements and techniques or methods and techniques to calibrate/troubleshoot and repair generic test equipment.

The door prize, a calculator, was won by Marty Levine.

Attendees:

John D. Bean
Ed Fiantaca
Brian Gurney
Carl Gustafson
Harold Hale
Henry Hall
Dan Hayes
Harry B. Haymes
John Hersh
Carl Jackson
Robert Leonard
Martin Levine
Ted Majewski
Wes McPhee
Larry Potaro
David Quimby
John Riccitelli
Bill Robinson
Wildred J. Spring, Jr.
Milt Towne
Peter Vogel

Astra Pharmaceutical
Continental Resources
Tekserv, Inc.
Portsmouth Naval Shipyard
Naval Underwater Sys. Ctr.
Hayes Instrument Svc.
Sanderson Associates, Inc.
Gen Rad
Northrup Corporation
General Electric
Frequency & Time Systems
Avco Systems Division
Charles Stark Draper Lab.
Teredyne
Itek
Foxboro
Raytheon Company
Digital Equipment Corp.
Sanders Associates, Inc.
Guildline Instruments
WELCOME TO OUR NEW NCSL MEMBERS

Oliver H. Watson Co.
232 Millbridge Road
Riverside, IL 60546
Delegate:
Mr. Oliver H. Watson

Naval Electronic Systems
Engineering Activity
(NEEA) Code 032
St. Inigoes, MD 20684
Delegate:
Mr. Bradley S. Wood

Hyland Division Travenol
Labsoratories, Inc.
Route 120 & Wilson Road
Round Lake, IL 60073
Delegate:
Mr. Robert L. Steibly

Qualimentrica
Rue Euclides Miraglia
394 Sala 1003
12-200-S.J. Campos,
S. Paulo Brazil
Delegate:
Dr. Walter DosSantos

ARGOSystems, Inc.
884 Hermosa Ct.
Sunnyvale, CA 94086
Delegate:
Mr. Thomas P. O'Brien

Department of the Army
Applied Technology Laboratory
USARL (AVRADCOM)
Fort Rustis, VA 23604
Delegate:
Mr. Thomas G. Mangrum, Sr.

IBM Corporation
1701 North Street
Endicott, NY 13760
Delegate:
Mr. Geoffrey B. Wilson

Cerberonics, Inc.
1411 Jefferson Davis Hwy.,
JF-1, Room 934
Arlington, VA 22202
Delegate:
Mr. Wayne R. Hay

General Electric Company,
Space Div.
P.O. Box 8555
Philadelphia, PA 19101
Delegate:
Mr. Alex Macarevich

Intel Corporation
3433 W. Earli Drive
Phoenix, AZ 85017
Delegate:
Mr. Daniel Lowe

Pacific Transducer Corp.
2301 Federal Avenue,
Los Angeles, CA 90064
Delegate:
Mr. William W. Taylor

Fairchild Semiconductor
All Angels Hill Road
Wappingers Falls, NY 12590
Delegate:
Mr. Richard W. Cobb

EMR Photoelectric
P.O. Box 44
Princeton, NJ 08540
Delegate:
Mr. David Jacoby

Sprague Electric Co.
87 Marshall Street
North Adams, MA 01247
Delegate:
Mr. Robert Janes
NCSL NEWS NOTES

SHORT COURSE ANNOUNCEMENT


Program is on how to obtain valid, cost-effective data in the field and in the laboratory through increased productivity of data acquisition systems and groups. The latest developments in the new and unique Unified Approach to the Engineering of Measuring Systems will be presented for the TWENTIETH YEAR. Test requesters, designers, theoretical analysts, managers, and experimental groups are the audience for which these programs are designed. Technical measurements of mechanical and thermal quantities are the major topics. All speakers have extensive industrial experience. Numerous experiments and demonstrations are performed for the audience.

NBS EVALUATES COMPACT RADAR CROSS SECTION/ANTENNA RANGE

Working for the Air Force, NBS has shown that planar near-field measurements are practical and valuable in aligning and evaluating compact ranges used for antenna and radar cross section measurements. NBS was able to extend the frequency range for such measurements up to 54.75 GHz, almost double the previous frequency ceiling. The ultimate goal is a frequency of 100 GHz. At this point, scaling factors 10 times larger than present ones can be used for radar cross section measurements of scaled models. This will allow the Air Force to obtain radar cross sections of much larger objects. The planar technique also provides a convenient way to precisely and accurately measure cross polarization levels which can pose real problems for compact ranges since they affect both radar cross section and antenna measurements. CONTACT: Fred McGeehan, (301) 499-1000, ext. 3244.

METROLOGY FOR SUBMICROMETER DEVICES AND CIRCUITS


N.J. TROOPER'S RADAR GUN IS RULED RELIABLE DEVICE BY APPEALS COURT

TRENTON, N.J. (AP) - The K-55 radar gun used by state police throughout New Jersey to catch speeding drivers is a reliable instrument for gathering evidence for court, an appeals court panel ruled in an opinion released yesterday.

Three judges from Appellate Division of Superior Court here, Robert A. Matthews, John L. Ard and Bertram Polow received a highway demonstration of the device before making the decision.

The K-55, a hand-held machine, can be used by a stationary police officer or by a trooper in a moving patrol car. It can register speeds of autos traveling in either direction.

Its reliability was challenged by Douglas Wojtkiak, who was charged with driving at 68 m.p.h. in a 55-m.p.h. zone on Route 295 in Burlington Township in December, 1978.

The court ruled that the K-55 is reliable, but it overturned Wojtkiak's conviction on an unrelated legal issue.

Since April, 1977, the K-55 has been the only radar unit used by New Jersey State Police, said spokesman, Lt. Joseph Kobus. He said the department has more than 500 of them and about 950 troopers trained to use them.

State Police Superintendent, Col. Clinton Pagano, has said that the state police realized as early as 1973 that the first generation of movable radar gear had problems but that tests with the K-55 proved it was reliable if operated properly.

"The K-55 radar is completely reliable as a speed-measuring device provided that it is properly operated by an individual who is competent to operate the radar after having been trained in its use," the opinion said.

But the court added that "its accuracy and reliability in any case are no better than the skill of the person operating the radar."

The court recommended that in future cases the state should include evidence of the operator's training and experience in radar, the calibration of the machine and the calibration of the speedometer of the patrol car if the K-55 is being used in a moving car.

Saturday, June 21, 1980

Philadelphia Inquirer
"SOUNDS OF FAILURE" HIGHLIGHTED IN NBS MAGAZINE

How might you tell if an airplane frame, reactor vessel, or bridge girder is developing a potentially dangerous crack? By listening for it.

Not with ears, but with sensitive transducers—devices that are called acoustic emission monitors, and it's one of the hot new topics in the growing field of nondestructive evaluation. How acoustic emission research came about, what it's going to get there is one of the stories in the latest issue of DIMENSIONS/NEWS, the news magazine of the Commerce Department's National Bureau of Standards (NBS).

"The Sounds of Failure" traces NBS efforts from the early 1970's to develop the delicate measurement and evaluation techniques necessary to realize the full potential of acoustic emission testing, using everything from breaking pencil leads to sophisticated computer analyses.

NBS OPTICAL FIBER MEASUREMENT PUBLICATIONS

The National Bureau of Standards (NBS) has published two technical notes on optical fiber measurements. Authors of the technical papers are with the Optical Metrology group of the NBS Center for Electronics and Electrical Engineering in Boulder, Colorado.

An Assessment of the Backscatter Technique as a Means for Estimating Loss in Optical Waveguides (TN 1018), by B. L. Danielson, employs computer modeling to describe the scattering and absorption loss properties of optical fibers.

The computer simulation permits a comparison between the direct (insertion) method of measuring attenuation and several methods of estimating attenuation from analysis of backscatter data. Numerous examples are given of physical effects that can produce discrepancies in attenuation values calculated from backscatter signals.

The author also gives some experimental comparisons between backscatter-derived and directly measured attenuation values in step and graded-index optical waveguide. Finally, Danielson outlines conditions necessary for good agreement between direct and backscatter methods.

Measurement of Optical Fiber Bandwidth in the Time Domain (TN 1019), by Douglas L. Franzen and G. W. Day, describes a system for determining optical fiber bandwidth from time domain measurements. They discuss the overall system architecture, precision, and dynamic range, and give typical experimental results.

A time domain measurement gives an optical fiber's frequency response by analyzing output and input waveforms. The authors provide an analysis of the variables affecting the measurement and discuss such input-related topics as launching conditions, mode scramblers, and laser diode sources. Other topics include the evaluation of laser diode sources for near field emission and chirping, a consideration of material dispersion limits, and evaluation of detectors for time response, linearity, and uniformity.

SOME SELECTED PUBLICATIONS OF NBS


Key words: conversion loss; diode measurement; intermediate-frequency (IF) output conductance, measurement uncertainties; microwave mixer diodes; modulation, point-contact diodes; reflectometer; return loss; Schottky-barrier diodes; semiconductor diodes; standing-wave ratio (SWR).

The measurement of mixer conversion loss using periodic or incremental modulation of the local oscillator, and the evaluation and minimization of the associated systematic and random uncertainties, are discussed in terms of an X-band mixer measurement system constructed at NBS. It is shown that the systematic uncertainty in the incremental modulation method of measuring conversion loss results largely from the uncertainties in the calibration of microwave attenuation and power.

It is also shown that the "modulation" (periodic modulation) and "incremental" (incremental modulation) methods of measuring conversion loss are essentially identical, the only practical distinction being in the somewhat different instrumentation required by the different modulation rates.

Several improvements in the periodic and incremental modulation techniques are introduced. Novel circuits for measuring intermediate-frequency output conductance and local-oscillator return loss are described which may also be useful for other imittance measurements.

The purpose of this report is to demonstrate the application of the NBS Automatic Pulse Measurement System (APMS) to measuring the pulse responses of optical communications components and to computing their impulse and frequency responses. For example we describe measurement of the properties of a glass fiber and an avalanche photodiode using both a pulsed GaAs laser diode (λ = 0.9 µm) and a mode locked, Nd:YAG laser (λ = 1.06 µm). All measurements were performed in the time domain; frequency domain data were obtained from the time domain data by using the Fast Fourier Transform (FFT). The impulse response was obtained by deconvolution.


Key words: dimensional metrology; electronics; integrated circuits, materials characterization; microelectronics; semiconductors.

The metrological requirements of semiconductor microelectronics, always challenging, are made even more stringent by the trend toward submicrometer devices and structures. This comes about not only because of the obvious demands associated with the smaller feature sizes of circuit elements but also because of the attendant requirements for more efficient design verification aids, computer simulations, and process validation and control techniques and because of the concurrent trend toward larger die and package sizes. This paper examines the types of metrological requirements associated with submicrometer devices and structures, summarizes the present state of the art in selected critical areas of metrology, and reviews current research and development efforts on advanced measurement technology, especially those at the National Bureau of Standards.


Key words: amplitude modulation; instrument landing system (ILS); measurement; instrumentation; measurement standard; modulation; modulation factor; modulation meter; Newton-Raphson method; percent modulation; signal generator; vhf omni-directional radio range (VOR).

A modulation factor standard has been developed to support the Federal Aviation Administration’s requirements for a measurement capability for the ILS and VOR navigation systems. The standard consists of both a precision modulation meter and a stable amplitude-modulated signal source. Although designed primarily for ILS and VOR signals, it has general purpose capabilities within an rf range of 10 MHz to 500 MHz and an af range of 20 Hz to 20 kHz. Measurement uncertainty is less than 0.11 percent modulation below 90 percent modulation for ILS and VOR tones of 90 Hz and above, and is somewhat greater than 30 Hz. Included are a circuit description and an error analysis.
The BIRE is obtained by arithmetically calculating the Hermitian magnitude of the incident electric field, and its variation is found to be less than ±1 dB.

**COMPUTER CONTROLLED METER CALIBRATION EQUIPMENT**


A computer controlled test facility, developed by Landis & Gyr has been installed in the company's new meter factory at North Acton, London. This has not only improved the speed and accuracy of calibration, but also reduced the floor area required by some 50%.

Four "Etalogoys" single phase test sets, each capable of handling 54 single phase meters (216 in all), are linked to a central computer which controls the four sets to enable them to operator completely independently.

The meters are fixed to the test racks by quick connectors and are preheated prior to testing in order to reduce calibration time.

Each meter position is equipped with an LED display showing the meter error, a light head, scanning the underside of the rotor disc, an amber lamp and a "start test" push button.

**CALIBRATION AND MAINTENANCE OF MPU-BASED TEST EQUIPMENT**

Author: Norbert Laengrich
Source: Electronics Test, April 1980

Like all other types of electronic instrumentation, test equipment requires full functional verification and regular maintenance for efficient operation. Although up design has resulted in test instruments that can automate complex measurements and generally make life easier for operators, test personnel must realize that 1960's approaches will not suffice for calibrating and repairing the new breed of equipment. In this article, Norbert Laengrich discusses the impact of ups on test equipment design and surveys the approaches and philosophies that have sprung up in response to the unique requirements of calibrating and troubleshooting up-based instruments.

**BRUNGART IS MAN OF YEAR**

Dean Brungart, Associate Director of Product Assurance and Manager of Metrology, Teledyne Systems, Co., has been named Man of the Year by the San Fernando Valley Section (SPVS) of the Precision Measurement Association. This is the first year for the award and Dean was a unanimous choice of the SPVS Executive Committee.

Bob Brainard, SPVS President, cited Dean's personal efforts toward rejuvenation of the section along with his enthusiastic and dedicated participation in section activities as factors contributing to Dean's selection.

He is a registered professional engineer, a senior member of the American Society of Quality Control, Vice President of Communications and Marketing for the National Conference of Standards Laboratories and is the nominee to be NCIS's Executive Vice President next year.

**NBS INSTRUMENT TO BE PRODUCED COMMERCIALLY**

A Minnesota firm has begun commercial production of an electric field strength meter that was first developed at the NBS Boulder Laboratories. The isotropic, broadband field strength meter measures frequencies between 0.5 MHz and 1000 MHz and field levels from one volt per meter up to 3000 volts per meter in seven ranges. Based on circuit diagrams and other data provided by Bureau staff during a visit by the firm's representatives to NBS Labs, the meter will assist private industry and government regulatory agencies which need such an instrument for measuring electromagnetic radiation levels. CONTACT: Fred McGehan, (303) 497-3244.
METROLOGY SYSTEMS

LANGLY RESEARCH CENTER LOAD CELL CALIBRATION SYSTEM

Royce F. McCormick and William F. Stewart

One of the most important research measurements made in Langley Research Center's ground simulation facilities and flight projects is that of force. An inventory of approximately 2,000 single-component instruments is maintained in the 0-100,000 pound range, most of these being dual bridge load cells. About 650 of these instruments are calibrated each year against standard load cells certified by the National Bureau of Standards.

In 1965, two digital load cell calibrators were purchased and proved to be very successful. The major drawback to these units was that they were single-channel. This meant that the load on the load cells under test had to remain constant while the output readings of the standard cell and both of the test cells were recorded. When the time came to replace these calibrators, a market survey showed that no suitable calibrator units were available commercially. LaRC designed and built two load cell calibrators as shown in Figure 1.

The LaRC calibrators have three channels, one for the standard cell and two for the test cells. The need for external voltage pre-amplification was eliminated since the digital ratiometers now available have the necessary sensitivity and stability. Separate power supply is used for the standard, while another is shared by the test channels in the LaRC calibrators.

The digital ratiometer in the standard channel is a Racal-Dana 6900, which has four-ratio capability with 0.1 microvolt sensitivity. The manufacturer provided a switch controlled modification that permits shifting the decimal to a position converting the readings into millivolts per volt. Power for the standard load cell is provided by a Hewlett-Packard 6114A power supply with the voltage output sensed at the front panel connector.

The two test cell channels have modified Fluke 8800 digital voltmeters as indicators, having a measurement resolution of one microvolt. Modifications to these meters include ratio measurement capability and a switch-controlled decimal point displacement for millivolts per volt display. Other changes in these meters are such that the display can be placed in a hold configuration upon command. The four-wire ratio circuitry for the two test channels is external to the digital voltmeters. The test bridge power supply feeds the reference side of the two ratio circuits employing two operational amplifiers per channel that are configured for unity gain output. This separate HP 6114A power supply is used for the test channels so that they can be operated at other than the 10 volt certification level of the standard load cells. Additionally, the test cell excitation voltage is sensed at the load cell connector panel, with great care taken to equalize the resistances of the two channels to avoid unbalanced voltage drops.

Due to inherent bridge unbalance, age, and use, a load cell often exhibits a zero-load output voltage offset. Although usually small, it nevertheless complicates the calibration task by requiring the test operator to subtract the unbalance from each reading. This inconvenience is eliminated in this load cell calibrator by use of a gage zeroing circuit across the standard load cell output. Another circuit with a fixed precision voltage divider provides the test operator with a quick push-button check of the bridge excitation voltage.

With calibrator pre-test complete, the standard load cell and test cell are subjected to the same loading (see Fig. 2). This load is increased until the standard load output reached a certified voltage level, which point the readings of the test channels are held (with the display "hold" switch) until they can be recorded at the operator's convenience. This process is continued throughout the range of the load cell, with both increasing and decreasing loads to determine load cell hysteresis, until the calibration is complete. Calibration of both load cell calibrators has shown their measurement uncertainty to be less than 0.01% without corrections.
Figure 1 - Load Cell Calibrator

Figure 2 - Load Cell Calibrator Block Diagram
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