

2014

# A guide to the Harold S. Black papers

Worcester Polytechnic Institute

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# Harold S. Black MS 09

07/06/2010

## Harold S. Black Papers

MS 09

Personal Papers

### SCOPE AND CONTENT

The paper consists of notes, articles and research relating to the Negative Feedback Theory; a series of presentation, speeches, and lectures; research notes and photographs and slides relating Bell Laboratories; patent information; biographical information and personal correspondence; miscellaneous reports, publications, and research notes.

### BACKGROUND

Harold S. Black was born in 1898 in Leominster, MA. He worked for AT&T's Bell Laboratories as an engineer, where he proved to be an important contributor to the advance of 20th century electronics and communications. Among his achievements was the negative feedback theory (1927), his most well-known accomplishment, which is a fundamental principle in electronics today. The negative feedback theory allows distortions introduced into a signal due to amplification to be eliminated by feeding part of the output signal back to the input and then comparing the two signals. Pulse Modulation, another of his more outstanding inventions, has many uses in military and domestic radio relay systems and has also played a major role in the process of moving from analog to digital electronics.

Black was known primarily as a prominent engineer, but was also a literary critic, teacher and lecturer. Through his career Black lived in New York City and then in Summit, N.J. where he died on December 11, 1983 at the age of 85. Black graduated from Worcester Polytechnic Institute (WPI) in 1921 and received an honorary doctorate in engineering from WPI in 1955.

The honors that Black received throughout the years are too numerous to list in their entirety. In 1981, he was inducted into the National Inventors Hall of Fame in Akron, OH and also received WPI's highest honor, the Robert H. Goddard Award for professional achievement. Harold Black wrote Modulation Theory that is known as a definitive source on the subject and was published in 1953. He has received 10 medals, 11 fellowships, 9 awards and numerous other recognitions throughout his career. Black holds 62 U.S. patents and amazingly, over 200 foreign patents. His ingenuity and engineering skill has placed him among the most influential engineers and scientists of this century and his contributions will continue to help advance the electronics and communications industries.

### Sources:

Aftermath. N.p.: n.p., 1921. 59.

An Age of Innovation: The World of Electronics. N.Y.: McGraw Hill, 1981. 173.

"Harold Black '21 honored at National Inventors Day." Newspeak 24 Feb. 1981: : 4.

"Honorary Degree Citations, Harold Stephen Black." WPI Journal 58.6 (1955): 8-9.

"Honoring Black." The WPI Journal 44.6 (1941): 6.

"Lamme Medal Winner." WPI Journal 62 (1958): 8+.

New Jersey Inventors Hall of Fame. 10 June 2003 <[http://www.njinvent.njit.edu/2001/inductees\\_2001/black.html](http://www.njinvent.njit.edu/2001/inductees_2001/black.html)>.

"Nothing negative about this feedback!" The WPI Journal 84.5 (1981): 18-19.

"Obituary, Harold S. Black." WPI Journal 87.4 (1984): 50-51.

"Positive news about negative feedback." The WPI Journal 81.6 (1978): 25.

"Recipient of Science Award." WPI Journal 56.3 (1953): 17.  
 "Success Story WPI Style." The Tech News 18 Mar. 1959: : 2.

**Container List**

Container	Folder	Date	Title
None			

**Series I: Feedback Theory**

MS 09\_001

Personal Papers

Notes, Articles, Research

**Container List**

Container	Folder	Date	Title
Box 1	Folder 01	1954	FEEDBACK THEORY-HSB NOTES <i>one hundred seventeen pages of handwritten notes, formulas, diagrams, graphs and typed 1954 notes titled "Plural Feedback-Case 38587", authored by H.S. Black, seven pages.</i>
Box 1	Folder 02		FEEDBACK THEORY-INTEGRATION <i>sixty-four pages of handwritten notes, formulas, diagrams, graphs.</i>
Box 1	Folder 03		FEEDBACK THEORY-NOTES <i>two hundred and nine pages of pages of handwritten notes, formulas, diagrams, graphs.</i>
Box 1	Folder 04		FEEDBACK THEORY-NOTES, CLOSED LOOP SYSTEM <i>nine pages of handwritten notes, formulas, diagrams.</i>
Box 1	Folder 05		FEEDBACK THEORY-NOTES, EFFECT OF FEEDBACK ON NOISE <i>twenty-three pages of typed and handwritten notes, formulas, diagrams, graphs.</i>
Box 1	Folder 06	1950	FEEDBACK THEORY-NOTES ON ZINN'S E.G. <i>Notes - Stability Study of Zinn's Example": seventy-four pages of handwritten notes, formulas, diagrams, graphs; twenty-six pages of typed notes &amp; graphs, dated 1950, titled "Note on the Stability of a Simple Feedback Circuit Containing a Negative Resistance - M.K. Zinn and S.O. Rice."</i>
Box 1	Folder 07		FEEDBACK THEORY-NOTES, SPECIFIC CCTS <i>one hundred pages of handwritten notes, formulas, diagrams, graphs.</i>
Box 1	Folder 08	1954	FEEDBACK THEORY-PARTICULAR ( $\mu$ )( $\beta$ ) CHARACTERISTICS <i>Many interesting examples": eighty-seven pages of handwritten notes, formulas, diagrams, graphs, some dated 1954.</i>
Box 1	Folder 09		FEEDBACK THEORY- ( $\mu$ )( $\beta$ ) A PARTICULAR EXAMPLE <i>fifty-eight pages of handwritten notes, formulas, diagrams, graphs.</i>
Box 1	Folder 10		FEEDBACK THEORY- ( $\mu$ )( $\beta$ ) STABILITY STUDY SP. EXAMPLES <i>thirty-three pages of handwritten notes, formulas, diagrams, graphs.</i>

Box 1	Folder 11		FEEDBACK THEORY- PLURAL FEEDBACK <i>ninety-six pages of handwritten notes, formulas, diagrams, graphs.</i>
Box 1	Folder 12		FEEDBACK THEORY- PLURAL FEEDBACK I <i>handwritten notes, formulas, diagrams, graphs.</i>
Box 1	Folder 13		FEEDBACK THEORY- PLURAL FEEDBACK II <i>Handwritten notes, formulas, diagrams, graphs</i>
Box 1	Folder 14		FEEDBACK THEORY- FEEDBACK NOTES <i>one hundred eighty-three pages of handwritten notes, formulas, diagrams, graphs.</i>
Box 1	Folder 15	1954	FEEDBACK THEORY- PRELIMINARY THOUGHTS <i>forty-four typed or handwritten notes/graphs; typed notes are a 1954 report titled 'Plural Feedback - Case 38587.'</i>
Box 1	Folder 16	1940	FEEDBACK THEORY- REFERENCES <i>four typed or handwritten ca. 1940 notes</i>
Box 1	Folder 17		FEEDBACK THEORY- REPETITIONS OF FEEDBACK PROCESS <i>twenty-eight pages of handwritten notes, formulas, diagrams, graphs.</i>
Box 1	Folder 18		FEEDBACK THEORY- RETURN DIFFERENCE AND SENSITIVITY <i>one handwritten page of notes and forty-two page report titled 'A General Treatment of Return Difference and Sensitivity in Feedback Systems - Case 38587' by J.F. Ossanna, Jr.</i>
Box 1	Folder 19		FEEDBACK THEORY-SHUNT FEEDBACK PART 1 OF 3 <i>sixty-four pages of handwritten notes, formulas, diagrams, graphs.</i>
Box 1	Folder 20	1954	FEEDBACK THEORY-SHUNT FEEDBACK PART 2 OF 3 <i>twenty-eight handwritten pages of notes, formulas, diagrams, graphs, dated 1954, stapled together, and titled "Shunt Feedback, Part 1, pp 1-9"; twelve additional pages of handwritten notes, formulas, etc.</i>
Box 1	Folder 21		FEEDBACK THEORY-STABILITY,FM RELATIONSHIPS <i>122 pages of handwritten notes, equations etc.</i>
Box 1	Folder 22		FEEDBACK THEORY- STABILITY NOTES I <i>Stability Notes, Also "Regeneration Theory Paper" H. Nyquist): twenty-seven pages of handwritten notes, formulas, diagrams, graphs and 1932 Bell Telephone System booklet titled "Regeneration Theory" by H. Nyquist</i>
Box 1	Folder 23		FEEDBACK THEORY- STABILITY NOTES II <i>forty-three pages of handwritten notes, formulas, diagrams, graphs.</i>
Box 1	Folder 24		FEEDBACK THEORY- UNFINISHED PHASE SHIFT CALCULATIONS <i>forty-one pages of handwritten notes, formulas, diagrams, graphs.</i>
Box 1	Folder 25	1950, 1954	FEEDBACK THEORY- ZINN-RICE MEMO <i>Notes by HSB": eighteen pages of typed notes &amp; graphs, dated 1950, titled "Note on the Stability of a Simple Feedback Circuit Containing a Negative Resistance - M.K. Zinn and S.O. Rice"; seventy-eight pages of handwritten notes, formulas, etc ... several dated 1954.</i>

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**Series II: Presentations**

MS 09\_002

Personal Papers

Speeches, Lectures, Talks

**Container List**

<b>Container</b>	<b>Folder</b>	<b>Date</b>	<b>Title</b>
Box 1	Folder 26		PRESENTATIONS-FEEDBACK LECTURE NOTES/HANDOUTS <i>104 pages of notes for a feedback lecture or seminar given by H.S. Black which includes a packet of handouts.</i>
Box 1	Folder 27		PRESENTATIONS-H.S. BLACK SPEECHES <i>Abstracts, handwritten and typed drafts and edited carbon copies of speeches by H.S. Black</i>
Box 1	Folder 28	1946	PRESENTATIONS-MICROWAVE CHAIN RADIO TRANSMISION <i>forty-two pages of primarily-typed 1946 papers related to a Milwaukee lecture, by HSB. Papers include the following titles: "Operational Procedures in Pulse Systems", "Operation of the AN/TRC-6", "2K22 &amp; 2K23 Vacuum Tubes", "Pulse Position Modulation Circuits", "Radio Communication."</i>
Box 1	Folder 29		PRESENTATIONS-RESEARCH AND DRAFT FOR HSB SPEECH ON BRAIN <i>nwspaper article on Bell Labs' Voice Operation Demonstrator (VODER); copy of 1975 article on cochlear implants; 1975 booklet/reprint of article by Mladejovsky, Eddington, Dobelle, and Brackmann on "Artificial Hearing for the Deaf by Cochlear Stimulation: Pitch Modulation and Some Parametric Thresholds"; copy of 1976 article on implanted electrodes, to aid the visually handicapped; 1976 "nature" booklet with article on implanted electrodes, to aid the visually handicapped; three-page typed article (by HSB?) titled "The Brain."</i>
Box 1	Folder 30		PRESENTATIONS-RESEARCH FOR APRIL 22, 1964 TALK @ BROOKLYN POLY. I <i>forty-seven typed or handwritten pages on talk, including letters related to the lecture</i>
Box 1	Folder 31		PRESENTATIONS - RESEARCH FOR APRIL 22, 1964 TALK @ BROOKLYN POLY. II <i>APRIL TALK; 4/22/64 @ IEEE Joint Student Branch - evening session; Polytechnic Institute of Brooklyn; 333 Jay Street, Brooklyn, NY; 10:00 PM ' 1 hr. talk; Professor George J Kent; Matthew L. Marabello (1962 chairman)": four booklets: Bell Telephone System's 'Evolving technology of communications', Pacific Telephone Annual Report 1963, Cornell Aeronautical Laboratory, Inc.'s 'Spectographs and Shock Tubes', Bell Telephone Laboratory's 'The Role of Bell Laboratories in Safeguarding America', Columbia Research News, Fall 1962 and Summer 1962, American Association for the Advancement of Science brochure; one-page typed abstract of HSB talk titled "Present Status of Waveguide Communications"; sixteen-page typed 1961 report - "United Nations Conference on Peaceful Uses of Outer Space"; three typed pages summarizing the accomplishments of HSB; two pages of handwritten notes on lecture; eleven-page 1961 article by C.F.P. Rose, titled "Shuttle Pulse Measurements Circular Electric Waveguide"; two-page handwritten lecture notes; 1962 Herald Tribune article on Dr. Niels Bohr; seven handwritten pages of lecture notes; one-page outline of HSB lecture: "New Developments in Communications Research"; one-page typed info on Bell Labs lecture series; eight pages of handwritten lecture notes; one-page summary of lecture by HSB: "Global Communications Via Artificial Earth Satellites"; 1962 WSJ article on Mariner Probe of Venus; three pages of handwritten lecture notes; three index cards of handwritten lecture notes; five handwritten lecture notes; four-page typed 1958 article: "Thoughts on Engineering for New Art"; seven pages of handwritten lecture notes; three-page Science article: "Freedom in Research"; one-page Sat Eve Post article: "Build it to work ... beneath the sea ... for 20 years"; one-page Western Electric ad on cables; fourteen typed or handwritten pages related to lecture; two small papers with handwritten notes; two-page typed 1961 letter to Mr. J.W. Joseph of NC, attached to two typed pages summarizing Black's career.</i>
Box 1	Folder 32	1963	PRESENTATIONS-TALKS BY HSB <i>two copies of 1963 HSB lecture: "New Developments in Communications Research"; two copies of 1962 HSB lecture: "Telstar"; summary sheet and three note pages on 1962 HSB lecture: "Exotic Communications"; two-sheet</i>

*published HSB article "Modern Communication Concepts Fundamental to Good Technical Writing"; three-page summary of HSB's career; four page 1961 "Telephone Talk" lecture by HSB; two-page typed notes/lecture on Echo I; two published pages on neurons; twelve typed lecture pages; seventeen handwritten pages of lecture notes.*

Box 1	Folder 33	1963	PRESENTATIONS-TALK OUTLINE-MULTILOOP FEEDBACK <i>Outline of a possible talk on generalized multiloop feedback configurations emphasizing non-linear effects impedance stabilizing, negative impedances and many other unknown or not well known relationships": four pages of handwritten lecture notes.</i>
Box 1	Folder 34	1963	PRESENTATIONS-W E Co GRADUATE TRAINING CENTER SATELLITE SLIDES (13) <i>Satellite Comm VU-Graphs not used (restore); 10, 11, 12, 13, 15, 28, 31, 32, 33, 34, 9, 8, 7"; thirteen transparencies</i>

### Series III: Research

MS 09\_003

Personal Papers

Bell Labs Research

#### Container List

Container	Folder	Date	Title
Box 2	Folder 01		RESEARCH: 4-14-65 PROJECT (MISC.) <i>forty-eight pages of handwritten notes, formulas, diagrams, graphs.</i>
Box 2	Folder 02		RESEARCH: BASIC MODULATION CONCEPTS SLIDES 1-9 <i>nine transparencies, primarily of graphs</i>
Box 2	Folder 04		RESEARCH-COMMUNICATIONS-HISTORICAL BACKGROUND SLIDES <i>four VU-Graph transparencies (one labeled 'Broadband Coaxial and Microwave Radio Routes'), apparently on satellite communication.</i>
Box 2	Folder 05	1959	RESEARCH-COMMUNICATIONS-NEW DEVELOPMENTS <i>one-page fact sheet on Telstar I and II; twenty-four pages of handwritten lecture notes; five, sundry, short, published articles; six Bell Labs Information Bulletins.</i>
Box 2	Folder 06		RESEARCH-ESSEX 52-58 <i>five transparencies (of equipment labeled 'Essex II')</i>
Box 2	Folder 07	1948	RESEARCH-EX. OF BW FOR TRANSMISSION OF INFO IN PRESENCE OF NOISE <i>seven typed-page report on 'Pulse Time Modulation' with cover page of handwritten notes; eight-page typed 1948 report by F.B. Llewellyn on 'Exchange of Bandwidth for Transmission Improvement in the Presence of Echoes - File 36690-1; four typed pages labeled 'Definitions'; three-page typed transcript of 'Talk by H.S. Black over WGBS - 9:30 March 23, 1930 - Case 96333'; three-page typed 1948 letter to Mr. A.B. Zerby, recommending Milton Ernst Mohr for nomination for Eta Kappa Nu' two-page typed report on 'Radio Progress During 1948 - Modulation Systems.'</i>
Box 2	Folder 08	1969	RESEARCH-FREQUENCY MODULATION <i>1,215 words DUE 4/15/69; It is intended to cover its history, how it works and where and why it is used [2nd letter specifies 162 lines for ??? for text which checks 7.5 words per line; (we have 66 lines art ' The illustrations); Encyclopedia Americana; FM - FREQUENCY MODULATION": four index cards of handwritten notes and diagrams; one page "Instructions for Contributors" from Science magazine; three-page article "Synchronism Doesn't Matter in ..."; forty pages of handwritten notes, formulas, diagrams, graphs; sixteen-page 1949 article "A Comparison of Signalling Codes - Case 20878", by E.N. Gilbert.</i>

Box 2	Folder 03		RESEARCH-CASCADE OPERATION-1157 <i>forty-three pages of handwritten notes, formulas, diagrams, graphs.</i>
Box 2	Folder 09		RESEARCH-GLOBAL SATELLITE COMM. EXTRA SLIDES (9) <i>nine transparencies</i>
Box 2	Folder 11		RESEARCH-INTERESTING SATELLITE SLIDES (9) <i>nine transparencies</i>
Box 2	Folder 12		RESEARCH-MEASURED & CALCULATED SKY TEMP. (1 SLIDE) <i>one unmounted transparency</i>
Box 2	Folder 13		RESEARCH-MICROWAVE RELAY SYSTEMS-MULTIPLE CHANNEL <i>three copies of twenty-three typed 1946 report on topic as on folder - one copy torn in half, each page; eight page typed 1943 report labeled "Secret" and "Microwave Communication Set - The M2 Radio Set - File B-448-C"</i>
Box 2	Folder 14		RESEARCH-MISC. NOTES ON ACCELEROMETER <i>two-page copy of article "High-energy accelerators for nuclear-physics research", by J.B. Adams; sixty-nine pages of handwritten notes, formulas, diagrams, graphs.</i>
Box 2	Folder 15		RESEARCH-MULTIPLEXING <i>Multiplex Systems by T.H. Crowley; 2. "Multiplexing" by Harold S. Black for McGraw Hill - Oct. 8, 1959": twenty-page typed Crowley lecture (as in label on folder); twenty-one typed or handwritten notes by HSB for "Multiplexing" lecture.</i>
Box 2	Folder 16		RESEARCH-NATURE OF LIGHT (MISC.) <i>five pages of handwritten notes; five-page 1962 article titled "An Engineer's View of the Universe", by S.C. Hight.</i>
Box 2	Folder 17	1947	RESEARCH-PCM FOR CARS <i>six typed-page 1947 report titled 'Suggestions Relating to PCM Transmission'; eleven handwritten pages of handwritten notes, formulas, diagrams, graphs; three-page typed 1947 report titled 'Band-Width Requirements of Quantized Systems - File 38621-1'; ten typed-page 1947 report titled 'Considerations of the Factors That Determine the Threshold of Interference for the TM Type of Modulated Signal.'</i>
Box 2	Folder 18		RESEARCH-POLE-MOUNTED RADIO SLIDES 52-55 <i>four transparencies</i>
Box 2	Folder 10		RESEARCH-GLOBAL SATELLITE COMM. PHOTOS (40) <i>forty b/w photographs on early satellite communications</i>
Box 2	Folder 19	1960	RESEARCH-PRESENT STATUS OF WAVEGUIDE COMMUNICATIONS SLIDES (4) <i>by Harold S. Black; a talkto be delivered before the Chicago Section of the IRE on March 11, 1960; four transparencies</i>
Box 2	Folder 20		RESEARCH-PULSE MODULATION THEORY 1 SLIDE <i>Time Division-Pulse Code Modulation; AM-FM Sampling Principle - Quantization"; one transparency</i>
Box 2	Folder 21	1942	RESEARCH-REVERBERATION <i>seven pages of handwritten notes on reverberation; two typed 1942 pages for memorandum on "General Radar Development"; five typed pages marked "Confidential" and "Relative Intensities in the Sound Field"; nine pages of handwritten notes, diagrams, formulas; two copies of lists of lab reports (number, engineer, subject).</i>

Box 2	Folder 22	RESEARCH-SATELLITE COMMUNICATION <i>three magazine articles on satellite communication; one page of handwritten notes.</i>
Box 2	Folder 23	RESEARCH-SATELLITE COMMUNICATIONS (21) <i>Originally unlabeled folder; twenty-one transparencies on early satellite communication</i>
Box 2	Folder 24	RESEARCH-SATELLITE COMMUNICATIONS 1-23" <i>thirteen transparencies on Telstar, satellite communication</i>
Box 2	Folder 25	RESEARCH-SATELLITE COMMUNICATIONS 24-34" <i>eleven transparencies on Telstar, satellite communication</i>
Box 2	Folder 26	RESEARCH-SUBMARINE RESEARCH <i>four pages of handwritten notes; four typed pages titled "S.D. Cable Schedules."</i>
Box 2	Folder 27	RESEARCH-TELSTAR I; DATA <i>eight typed pages describing Telstar and satellite communication.</i>
Box 2	Folder 28	RESEARCH-TRC-6 FIELD APPLICATIONS <i>one page of handwritten notes; four typed pages of a memorandum on the "Nantucket-Barnstable - AN/TRC-6 Microwave Radio Link - Case 36740-4"; seven page Aug. 1946 typed memorandum for "Microwave Radio Systems - Relationship of Casts to Location of Sites and Costs of 50 to 400 Ft. Towers - Case 36740-2"; one-page typed report on "TRCE Equipment Available for New Installations"; twelve-page typed 1946 report on "Microwave System - Richmond, Virginia and Washington, D.C. to Points in Central and Western Virginia.</i>
Box 2	Folder 29	RESEARCH-UNLABELED SLIDES (4) <i>4 unlabeled slides which seem to be on multiplexing in communications systems</i>
Box 2	Folder 30	RESEARCH-WAVEGUIDE SYSTEM 33-42 <i>eight transparencies</i>

## Series IV: Personal Info

MS 09\_004

Personal Papers

Biographical Info, Correspondence

### Container List

Container	Folder	Date	Title
Box 2	Folder 31		PERSONAL-BIOGRAPHICAL INFO <i>Assorted handwritten notes, articles, photocopies, and other info on the life of Harold S. Black</i>
Box 2	Folder 32		PERSONAL-CORRESPONDENCE TO/FROM H.S.BLACK <i>99 pages of correspondence to or from H.S. Black which is mostly business correspondence</i>
Box 2	Folder 33		PERSONAL-CORRESPONDENCE TO/FROM META BLACK <i>44 pages of correspondence to or from Mrs. Meta Black mostly regarding her estate and/or plans for a scholarship at WPI in the name of Harold S. Black</i>
Box 2	Folder 34	1965	PERSONAL-COURSES, CONVENTIONS, LECTURES <i>four booklets/brochures describing same.</i>



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**Series V: Misc.**

MS 09\_005

Personal Papers

Handwritten Notes, Misc papers, WPI Related Material

**Container List**

<b>Container</b>	<b>Folder</b>	<b>Date</b>	<b>Title</b>
Box 2	Folder 35		MISC-EMPTY FOLDER COVERS <i>Photocopies of covers of empty brown folders</i>
Box 2	Folder 37		MISC-H.S.B. HANDWRITTEN NOTES/MISC. ITEMS <i>19 miscellaneous papers and one photograph of various origins</i>
Box 2	Folder 38		MISC-H.S.B 1940 PERSONAL CORRESPONDENCE <i>four-page typed 1940 correspondence to Mr. L. Espenschied; four-page typed 1940 report on 'Feedback Amplifiers - Possibilities of Additional Ideas. Case 37014.'; one-page typed letter to Henry Allen at Franklin Institute; two-page 1940 typed correspondence from J.A. Becker; two-page typed report on "M.I.T. Cooperative Student"; one-page typed 1940 letter from AIEE; one-page typed report on 'Jim Thorpe - Case I - Gain Control System - Comments'; two-page typed 1940 correspondence/report from L. Espenschied on the eye; two-page typed correspondence from H.T. King, on his application for admission to A.I.E.E.; two-page typed 1940 correspondence to Mr. H.A. Burgess, on 'Frequency Modulated Wave for Pilot Channel Regulators'; one-page typed 1940 correspondence to Mr. P.J. Roche, on 'Great Britain Patent No. 11632140 (P.B. Jacobsen-A.H. Roche 29-33).'</i>
Box 2	Folder 39		MISC-IRE APPLICATION <i>five 1941 papers related to application for the Institute of Radio Engineers.</i>
Box 2	Folder 40	May 9, 1949	MISC- MISC. PAPERS ON DESK <i>forty-seven pages of handwritten notes, formulas, diagrams, graphs; seventeen pages of typed 1949 "Minutes of the Modulation Systems Committee Meeting of March 14, 1945 at I.R.E. Headquarters.</i>
Box 2	Folder 41	May 17, 1946	MISC- PAPERS TO LEFT FRONT OF DESK <i>ninety-two pages of handwritten notes, formulas, diagrams, graphs; eight typed pages of correspondence from W.A.S. Butement of Surrey, England, includes a career summary</i>
Box 2	Folder 42		MISC-RADIO SCHOOL BIBLIOGRAPHIES <i>twenty-one typed pages of brief biographies (of Bell Labs staff?).</i>
Box 2	Folder 43		MISC-VU-GRAPH BLANKS (12)" <i>twelve blank transparencies</i>
Box 2	Folder 44		MISC-WPI PLEDGE CARDS <i>ten papers and two booklets related to soliciting pledges for WPI.</i>

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**Series VI: Patent**

MS 09\_006

Patent

Patent Info, Copies, Descriptions

**Container List**

<b>Container</b>	<b>Folder</b>	<b>Date</b>	<b>Title</b>
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Box 3	Folder 01	PATENT-HAROLD S. BLACK PATENT INFO <i>Handwritten lists of H.S. Black patents as well as some copies of patents</i>
Box 3	Folder 02	PATENT-NEW PATENTS <i>twelve typed pages related to 1940 HSB patent; seventeen handwritten pages related to HSB patent(s?); two pages typed correspondence related to patent for 'Thermistor Regulator.'</i>
Box 3	Folder 03	PATENT-PATENT APPLICATION - COPY OF CASE 16 HSB <i>Copy of Case 16; Date Filed in U.S.A. - August 7, 1928; Vocation of Inventor: RESEARCH ENGINEER": forty-eight typed pages explaining wave translation systems (for patent application?).</i>
Box 3	Folder 04	PATENT-PATENT COPIES <i>copies of nine HSB patents.</i>
Box 3	Folder 05	PATENT-WORK FOR PATENT-HSB NOTE CONCERNING 3 FOLDERS <i>3-folder bundle cover sheet that states: "Work mostly by HSB prior to a discussion of McColl's 1926 work preceding my book on modulation. These unbound notes led to one of my 62 US patents I think - since I have the patents this can be easily checked some day when I have the time - HSB - Nov 23, 1977."</i>
Box 3	Folder 06	PATENT-(I) WORK FOR PATENT-CONSTANT R FILTERS <i>Does not include Telegraph Filter" (part of a bundle of three folders with): four stapled pages from US Patent Office, on Le Roy A. MacColl's 1935 patent for 'Signaling Method and Apparatus.'; one hundred and eighteen pages of handwritten notes, formulas, diagrams, graphs.</i>
Box 3	Folder 07	PATENT-(II) WORK FOR PATENT-MOD THEORY, OLD CH 8. <i>(not published) plus an important long-hand Note; Figures previously filed in 3-1-11 are included; (These figures apparently are different in at least numbered different)" (part of a bundle of three folders with cover sheet that states: "Work mostly by HSB prior to a discussion of McColl's 1926 work preceding my book on modulation. These unbound notes led to one of my 62 US patents I think - since I have the patents this can be easily checked some day when I have the time - HSB - Nov 23, 1977."): four stapled pages from US Patent Office, on Le Roy A. MacColl's 1935 patent for 'Signaling Method and Apparatus.'; fifty-eight pages of typed and handwritten notes, formulas, diagrams, graphs.</i>
Box 3	Folder 08	PATENT-(III) WORK FOR PATENT-CHAPTER WITH FIGURES <i>Figures added by removing (?) from file 3-1-11" (part of a bundle of three folders with cover sheet that states: "Work mostly by HSB prior to a discussion of McColl's 1926 work preceding my book on modulation. These unbound notes led to one of my 62 US patents I think - since I have the patents this can be easily checked some day when I have the time - HSB - Nov 23, 1977."): four stapled pages from US Patent Office, on Le Roy A. MacColl's 1935 patent for 'Signaling Method and Apparatus.'; forty pages of typed 'Chapter 8' and/or graphs.</i>

## Series VII: Technical Papers

MS 09\_007

Papers, Personal

Journal copies, Drafts

### Container List

Container	Folder	Date	Title
Box 3	Folder 09		TECHNICAL-ASSORTED DRAFTS OF TECHNICAL PAPERS <i>Assorted drafts of technical papers written by H.S. Black and also by others who wanted corrections by H.S. Black</i>

Box 3	Folder 10		TECHNICAL-ASSORTED JOURNAL ISSUES <i>3 issues of Bell Labs News, 1 scientific American, 1 Kearfott pamphlet, 1 Bell Laboratories Record, 1 Proceedings of IEEE, 1 Doings of Life Members, 1 Electrical Engineering</i>
Box 3	Folder 11		TECHNICAL-ASSORTED PAPERS, ARTICLES, CLIPPINGS <i>118 pages of miscellaneous papers and articles which were not written by H.S. Black.</i>
Box 3	Folder 12	April 22, 1964	TECHNICAL-ASSORTED PAPERS, ARTICLES, CLIPPINGS <i>four handwritten pages of notes; thirty-seven page 1961 report titled "Congressional Presentation - Communications Satellites", by Leonard Jaffe, Chief Communicatiobs Satellite Program; forty-six page 1961 typed lecture titled "New Developments in Communications Research" by Harold S. Black; twenty-seven page lecture by HS Black, titled "Communications of Tomorrow."; two loose pages from lecture by HS Black, titled "Communications of Tomorrow."</i>

**Series VIII: Bell Photos**

MS 09\_008

Photographic Print

Bell Labs Photos, Slides

**Container List**

<b>Container</b>	<b>Folder</b>	<b>Date</b>	<b>Title</b>
Box 3	Folder 13		BELL PHOTOS-BELL LABORATORIES SLIDES (3) <i>three VU-Graph transparencies.</i>
Box 3	Folder 14		BELL PHOTOS-BELL LABS PHOTOS <i>6 photocopies of photographs from Bell Labs on the Toll Systems</i>
Box 3	Folder 15		BELL PHOTOS-UNLABELED BELL LABS PHOTO PRINTS (37) <i>37 small photo prints of what appears to be Bell Labs research facilities and systems.</i>

**Series IX: Modulation Tests on K-2 Carrier System Amplifiers Notebook**

MS 09\_009

Memorandum

**Container List**

<b>Container</b>	<b>Folder</b>	<b>Date</b>	<b>Title</b>
Box 3	Folder 17		WAVE FILTERS MEMORANDA - III <i>Blue cloth-covered notebook with 1924, 1929, 1931 typed pages on "Equivalent Impedance Transformations" etc, by Otto Zobel.</i>

**Series X: Wave Filters Memoranda - III, Blue, Canvas bound papers**

MS 09\_010

Notebook

**Container List**

<b>Container</b>	<b>Folder</b>	<b>Date</b>	<b>Title</b>
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**Series XI: Record Book**

MS 09\_011

Ledger

**Container List**

<b>Container</b>	<b>Folder</b>	<b>Date</b>	<b>Title</b>
Box 3	Folder 18		Record
<p><i>Six-inch wide by nine and one-half inch high ledger book, stamped "RECORD" on the front cover. Inside front cover has notation: Harold S. Black; 120 Winchip Road; Countryside; Summit, NJ 07901; Miscellaneous information most of which I need to know." Ledger contains taped-in articles, obits, quotes, names of physicians, definitions, etc</i></p>			

**Series XIII: 13 Issues (7-10, 12-20) of "Course in Human Engineering..."**

MS 09\_013

Personal Papers

"Course in Human Engineering -Harrington Emerson, Self-Organization-Practical Methods."

**Container List**

<b>Container</b>	<b>Folder</b>	<b>Date</b>	<b>Title</b>
Box 3	Folder 20		Self-Organization-Practical Methods
<p><i>Lesson books labeled "Course of Human Engineering-Harrington Emerson, Self-Organization-Practical Methods." Books include lessons 7-10 and 12-20.</i></p>			

**Series XIV: Components in Manilla Envelope**

MS 09\_014

Unidentified Objects

**Container List**

<b>Container</b>	<b>Folder</b>	<b>Date</b>	<b>Title</b>
Box 3	Folder 21		Components in Manilla Envelope
<p><i>Seven small plastic containers that hold un-identified components. The plastic containers are labeled 1-7. Components possibly used for an experiment or research.</i></p>			