

Western Electric

Components
Condensers

GENERAL BULLETIN

EQUIPMENT BULLETIN

CONDENSERS, D-92583 & 181-A

Replacing S.B. #57 12/10/30
 Replacing S.B. #57, Addendum #1 2/11/31

O. Reason for Reissue

- 0.1 To present complete information regarding the replacement of 21-OB Condensers by D-92583 Condensers in 42 and 46 type Amplifiers, and in other equipment.
- 0.2 To revise price information in Section 3.

1. Description

1.1 General Information

	D-92583 Cond.	181-A Cond.	21-OB Cond.
Capacity	1 MF.....	1 MF.....	1 MF.....
Break. Test	2000 V.DC.....	2000 V.DC.....	1000 V/50c.....
Max. Wtg.	(1000 V.DC.....)	(1000 V.DC.....)	
Voltage	(300 V/60c.....)	(300 V/60c.....)	
Size (in.)	1-25/32x1-21x3/2x4-7/16	1-19/32x1-7/16x3/4	1-25/32x1-21/32x4-7/16

1.2 AMPLIFIERS FORMERLY PROVIDED WITH 21-OB CONDENSERS are to be manufactured using 181-A Condensers instead. The latter have a higher breakdown voltage, and will give better service under operating conditions.

1.3 THE D-92583 CONDENSER is electrically the same as the 181-A Condenser, and is intended for replacing existing 21-OB Condensers in the field. The smaller size of the 181-A Condenser makes it unsuitable for this purpose.

1.4 INTERRUPTIONS IN PERFORMANCES, due to condenser failure in 42 and 46 type amplifiers should be practically eliminated by a complete replacement of the 21-OB Condensers in the filter circuits of these Amplifiers by D-92583 Condensers. The cost is relatively small, and from the customers standpoint, the change should be very desirable. A recent analysis of emergency calls shows that interruptions in performance occurred in 50% of the cases of such condenser failure. THE ADVANTAGES OF A COMPLETE CONDENSER REPLACEMENT (EVEN IF NO TROUBLE HAS YET BEEN EXPERIENCED) IN THE 42 AND 46 TYPE AMPLIFIER FILTER CIRCUITS AS INSURANCE AGAINST PROGRAM INTERRUPTION, SHOULD BE POINTED OUT TO CUSTOMERS.

2. Replacement of 21-OB Condensers

- 2.1 USE THE D-92583 CONDENSER to replace any defective 21-OB Condenser in any equipment (not only in 42 and 46 type Amplifiers).
- 2.11 ON THE 42-A AMPLIFIER, if one or more of the 21-OB Condensers in the Filter Bank (C-1 to C-5 inc.) become defective, replace the whole group (C-1 to C-5 inc.) by eight D-92583 Condensers.
- 2.12 ON THE 46 TYPE AMPLIFIERS, if one or more of the 21-OB Condensers in the Filter Bank (C-6 to C-11 inc.) become defective, replace the whole group (C-6 to C-11 inc.) by six D-92583 Condensers.
- 2.2 DESTROY LOGICALLY ALL REMOVED 21-OB CONDENSERS, whether defective or not, except when replaced against an Operating Department Work Order, in which case return them to the Stores Division on an R3 Tag.
- 2.3 REPORT AS AN EQUIPMENT CHANGE (See S.B. #53) all 21-OB Condenser replacements in accordance with the above.

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3. Prices

- 3.1 Single units or groups replaced in agreement with this Bulletin will be charged to the Customer on a full price basis as follows:
- 3.2 Single D-92583 Condenser, \$1.50.
- 3.3 A bank of six D-92583 Condensers as a group, \$9.00.
- 3.4 A bank of eight D-92583 Condensers as a group, \$12.00.

4. Availability

- 4.1 D-92583 CONDENSERS are now available. 181-A Condensers are not yet available. Order D-92583 Condensers to replace 21-OB or existing D-92583 Condensers as follows:
 "One D-92583 Condenser"
- 4.2 ORDER D-92583 CONDENSERS in the regular way on an S.D. Order. They may be supplied immediately from the "Emergency Material Parts" carried by each Engineer (See S.B. #36, File S.34), provided the Engineers supply can be immediately replenished.
- 4.3 ALL 42 AND 46 TYPE AMPLIFIERS shipped from either the Stores Division or Emergency Stocks after March 15th, will be equipped with D-92583 Condensers instead of 21-OB Condensers in the Filter Circuit Bank as described above in 2.11 and 2.12.

JEF:8C

Electrical Research Products Inc.

CONDENSERS, GENERAL

4.05

EQUIPMENT BULLETIN

CONDENSERS, GENERAL

4.05

Electrical Research Products Inc.

CONDENSERS, GENERAL

4.05

Code	Capacity (MF)		Test Voltage	Apparatus Used In	*To be Replaced By
	Max.	Min.			
21-D	2.70	2.00	500-DC	700-A & 706-A Cont. Caps.; 521-A Subcriber Set, and 34-A & B Amps.	
21-F	1.35	1.00	500-DC	706-A Cont. Cap.	
21-H	0.135	0.10	1200-AC	700-A & 701-A Cont. Caps.	
21-X	1.35	1.00	500-DC	32-A Ampl.	
21-U	0.068	0.05	1200-AC	706-A Cont. Cap.	
21-Y	0.338	0.25	1200-AC	701-A Cont. Cap.	
21-AA	1.150	1.00	1000-AC	701-A Cont. Cap.	
21-AX	0.675	0.50	1000-AC	708-A, 712-A Cont. Caps.; 43-A Ampl.	
21-AS	0.675	0.50	1000-AC	708-A Cont. Cap.	
21-BS	0.675	0.50	500-DC	706-A Cont. Cap.	
21-BA	1.12	1.00	1000-AC	706-A Cont. Cap.	
21-BD	1.12	1.00	500-DC	706-A Cont. Cap.	
21-BW	1.25	1.00	500-DC	41-A & 41-B Amps.	
21-GB	1.15	1.00	1000-AC	708-A & D-86651 Cont. Caps.; D-86446, 25-C, 41-A & B, 42-A & B, 42-A all types, 51-A & 59-A Amps.	
21-OH	0.675	0.50	500-DC	40-A & 51-A Amps.	
21-OP	1.35	1.00	500-DC	34-A Ampl.	
21-QD	2.14	2.00	500-DC	706-A Cont. Cap.	
57-A	2.70	2.00	500-DC	8-B & C Amps.; D-85125, 203-B & 518-B Panels	
57-B	1.35	1.00	500-DC	D-8499 Amps.; D-85125, 203-B & 518-B Panels	
57-F	0.675	0.50	500-DC	218-A Panel	
57-AD	0.675	0.50	1000-AC	708-A Cont. Cap.	
57-AF	1.15	1.00	1000-AC	8-B & C Amps.	
57-AK	(Cap. adjusted as req.)	0.85	500-DC	8-B & C Amps.; D-81778 Equalizer	
57-AJ	0.24	0.25	1000-AC	8-B & C Amps.	
57-C	0.074	0.074	500-DC	D-86849 Reproducer Set	
76-EP	0.0070	0.00695	500-DC	D-82125 Equalizer	
87-8	1.25	1.00	250-DC	D-86725 D-85937, 49-A & B & 50 type Amps.	
95-D	1.15	1.00	4000-DC	43-A Ampl. & 519-A Panel	
129-A	0.01	0.006	500-DC	6-A Equalizer	
137-A	5.00	4.00	500-DC	57-A & 59-A Amps.	
140-B	0.62	0.50	1000-AC	700-B Apparatus Unit	
141-B	0.625	0.50	500-DC	713-A Cont. Cap., 57-A & 59-A Amps.	
141-C	0.625	0.50	500-DC	57-A Ampl.	
147-A	2.50	2.00	500-DC	700-A & 708-A Cont. Caps., 521-A Subcriber Set; 34-A & B Amps.	
147-B	1.25	1.00	500-DC	(Two units not connected)	
149-A	1.25	1.00	500-DC	See 21-F, 21-K & 21-BW	
149-B	0.62	0.50	500-DC	See 21-A9 Amps. Mod. per TA-137	
151-A	0.115	0.10	0.85	708-A Amps. Mod. per TA-137	
162-A	3.00	2.00	1400-DC	708-C Cont. Cap.	
162-B	3.00	2.00	1400-DC	708-C Cont. Cap.	
162-C	3.00	2.00	1400-DC	709-C Cont. Cap.	
160-A	1.15	1.00	4000-DC	43-A Ampl.	
181-A	1.15	1.00	2000-DC	D-86446, 25-C, 41-A, 34-A & B types, 51-A, 57-A & 59-A Amps.	
182-A	0.575	0.5	2000-DC	243-A & B Condensers	
221-A	1.15	1.00	2000-DC		
222-A	0.575	0.500	2000-DC	713-A Cont. Cap., 57-A Ampl.	
243-A	3.55	3.58	2000-DC	203 Reproducer Set, all types	
243-B	3.55	3.50	2000-DC	203 Reproducer Set, all types	

* REPHRASING

Orders for condensers are to be worded according to the information listed under the "Code" column, followed by the word "Condenser". Condensers listed under the "To be Replaced By" column will not be supplied until the stock of the replaced condenser is exhausted. Therefore in general order by the old code number unless specified otherwise in Equipment Bulletin.

2 Pages - Page 1 Operating Dept. Equipment Div. Issued by January 4, 1952

2 Pages - Page 2 Operating Dept. Equipment Div. Issued by January 4, 1952

1. Purpose

1.1 To add to list of condensers, and to include information on "dry" electrolytic condensers.

2. Additions

Code	Capacity (MF) Max. Rated Min.	Test Voltage	Apparatus Used In	To Be Replaced By
D-94958	2.	-	D-95036 Ampl.	-
D-95008	3.	-	D-95036 Ampl.	-
D-95009	1.	500 (DC)	D-95036 Ampl.	-
D-95010	2.	-	D-95036 Ampl.	-
Sengamo .012 MF	.012	-	62-A Ampl.	-

3. "Dry" Electrolytic Condensers

Condenser	KS-7160	TA-4115	200MF-200V	1000MF-24V*	2000MF-18V*
Capacity	900	2000	200	1000	2000
Rated Voltage	24	24	200	24	18
Where Used	Current Supply Sets & Filters	Power Units, Filter Systems	TA-4030	M.G.	M.G. Systems

*See Section 3.5

3.2 Installation - These condensers are supplied separate from the power units, filters, etc. (except in TA-4030 Filter), in which they are used. Install them as specified on the wiring diagrams for such power units, filters, etc. or on the M.G. system drawings. Scratch installation data plainly ("Installed Data") on each electrolytic condenser, as in time these condensers dry out with resultant reduction in capacity, making their replacement necessary.

3.3 Operation - In general, "dry" electrolytic condensers consist essentially of two aluminum foils separated by fabric impregnated with an electrolyte and sealed. An impressed voltage across the condenser causes a film of aluminum oxide to be formed on the anode. This film is relatively thin and tough. The dielectric of the condenser is dependent on this film so that the condenser may be described as consisting of one plate which is the positive aluminum foil and is called the anode, the dielectric which is associated with the oxide coating on the positive foil, and the electrolyte which acts as the cathode. The negative foil is merely for contact with the electrolyte. The capacity of this type condenser is ultimately inversely proportional to the impressed voltage, that is, the higher the voltage the less the capacity per unit area of positive electrode.

3.4 Maintenance - Due to the construction of the "dry" electrolytic condensers, they must not be left unused for more than eight weeks, as, destructive disintegration of the insulating film may result. Accordingly, in cases, such as temporary shutdowns, etc. the electrolytic condenser must be reformed at least every eight weeks by either one of the following methods:

(a) Turn on the power supply to the equipment with which the condenser(s) are associated and leave supply on for 24 hours, viz., to reform the TA-4115 Condensers used in the TA-4035 Power Unit, turn on the 110V AC supply to the power unit, and leave on for 24 hours. It is not necessary that any external load be used.

(b) Remove electrolytic condenser(s) from the equipment. Procure a number of batteries (preferably storage; "B" batteries may be used) which when connected in series, will provide a DC voltage within ± 10% of the rated voltage of the condensers. Connect condensers in parallel to this DC supply (observing polarity). Insert them in this forming circuit one at a time since each condenser draws a considerable current for a few seconds. Leave in circuit 24 hours. Fig. 1 shows five TA-4115 Condensers so connected to either storage or "B" batteries.

NOTE: The initial leakage current of these condensers may be in the order of 1 to 2 amperes, dropping off to approximately 0.05 amperes after 20 seconds. For this reason it is desirable to allow 20 seconds to elapse between the successive insertions of condensers in the forming circuit.

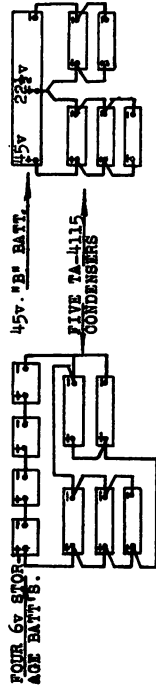


FIG. 1

3.5 Merchandising - The KS-7160, TA-4115 and 200MF-200V (Electrolytic) Condensers are available in the Stores Division, and should be ordered as:

"One KS-7160 (or TA-4115 or 200MF-200V) Condenser"

The 2000MF-18V and 1000MF-24V Condensers are no longer available. They are replaced by the TA-4115 Condensers.

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O. Reason for Release: To revise maintenance information on "dry" electrolytic condensers, as a result of subsequent investigation.

1. Additions to List of Condensers

D-94926 (2MF), D-95008 (3MF), D-95009 (1MF) & D-95010 (2MF), all used in D-95036 Amplifier.
Sangamo (.012MF), used in 62-A Amplifier.

2. "Dry" Electrolytic Condensers

Condenser	KS-7160	TA-4115	200MF-200V	1000MF-24V	2000MF-18V
Capacity	900MF	2000MF	200MF	1000MF	2000MF
Rated Voltage where Used	24V	24V	200V	24V	18V
Cur. Sup. Sets & Filters	Power Units, Filters, etc.	TA-4030	M.G. Systems	M.G. Systems	M.G. Systems

*See Section 2.5

2.2 Installation - These condensers are supplied separate from the power units, filters, etc. (except in TA-4030 Filter), in which they are used. Install, them as specified on the wiring diagram, for such power units, filters, etc. or on the M.G. system drawings. Scratch installation date plainly (in un-stalled date) on each electrolytic condenser, as in time these condensers dry out with resultant reduction in capacity, making their replacement necessary.

2.3 Operation - In general, "dry" electrolytic condensers consist essentially of two aluminum foils separated by fabric impregnated with an electrolyte and sealed. An impressed voltage across the condenser causes a film of aluminum oxide to be formed on the anode. This film is relatively thin and tough. The dielectric of the condenser is dependent on this film so that the condenser may be described as consisting of one plate which is the positive aluminum foil and is called the anode, the dielectric which is associated with the oxide coating on the positive foil, and the electrolyte which acts as the cathode. The negative foil is merely for contact with the electrolyte. The capacity of this type condenser is ultimately inversely proportional to the impressed voltage, that is, the higher the voltage the less the capacity per unit area of positive electrode.

2.4 Maintenance - No maintenance is ordinarily required for these condensers. However, it has been found that in the case of a small percentage of the product supplied by the manufacturer, there may be a tendency for abnormal depolarization if the condensers are allowed to remain unused for any great length of time. For this reason it is advisable, in the case of idle condensers, to turn on the power supply to the equipment with which the condensers are associated (no external load required) for a period of from 8 to 24 hours after every two months of idleness, thereby allowing the condensers to reform in their regular circuits. The reproducing system may be used during the reforming process as soon as it is evident that the equipment is functioning satisfactorily without an objectionable hum level. Inasmuch as only a very small percentage of the condensers will become defective during periods of idleness, no additional expense is warranted in carrying out these instructions; that is, in all cases where reforming the condensers every two months will result in additional engineer's expense, this operation should be dispensed with.

2.5 Merchandising - The KS-7160, TA-4115 and 200MF-200V (Electrolytic) Condensers are available in the Stores Division, and should be ordered as "One KS-7160 (or TA-4115 or 200MF-200V) Condenser". The 2000MF-18V and 1000MF-24V Condensers are no longer available in the Stores Division. They are, however, available in Emergency Stocks. The 2000MF-18V Condensers will continue to be used as required, for noise reduction purposes. The 1000MF-24V Condensers will be held in Emergency Stocks pending further instructions. Upon exhaustion of the branch office stock of the former, they will be replaced by the TA-4115 Condensers.

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CONDENSERS, GENERAL

O. Reason for Release
Replacing E.B. Condensers, D-92583 & 181-A

O.1 To bring tabulated list of condensers up to date; to include the information formerly covered in E.B. Condensers, D-92583 & 181-A, F.R. 4.05; to include information regarding the TA-4149 and the improved TA-4115 Condensers, and to revise the maintenance information on "dry" Electrolytic Condensers.

1. General Information on Condensers

Condenser Code No.	Capacity (MF)		Test Voltage	Apparatus Used In	Replacement Code No.
	Max.	Rated Min.			
21-D	2.70	2.00	500-DC	74 Type Amps, 700 & 708 Type C.C.	(147-A with P-409555 Adapter)
21-F	1.35	1.00	500-DC	521 Type Sub. Set 700, 706 & 708 Type C.C.	149-A with P-409556 Adapter
21-H	0.135	0.10	1200-AG	201 Type Panels	21-H
21-K	1.35	-	500-DC	700 & 701 Type C.C.	149-A with P-409556 Adapter
21-U	0.068	0.05	1200-AG	706 Type C.C.	21-U
21-Y	0.338	0.25	1200-AG	701 Type C.C.	21-Y
21-AA	1.150	1.00	1000-DC	701-Type C.C.	21-AA
21-AK	0.675	0.50	1000-AG	43 Type Amp. 706 & 712 Type C.C.	21-AK
21-AL	-	0.25	1000-AG	706 Type C.C.	21-AL (Note: 2)
21-AS	0.675	0.50	500-DC	706 Type C.C.	149-B with P-409556 Adapter
21-BA	-	0.01	1000-AG	700 Type C.C.	21-BA
21-BD	1.12	1.00	500-DC	706 Type C.C.	21-BD
21-EW	1.25	1.00	500-DC	41 Type Amp.	149-A with P-409556 Adapter
21-OB	1.15	1.00	1000-AG	708 Type & D-86651 C.C. 25, 32, 34, 41, 42, 46, 51 Type & D-86446 Amps. TA-7113 Filter 25, 32, 34, 42, 46, 51 Type & D-86446 Amps.	D-92583 (Sect. 2)
21-OH	0.675	0.50	500-DC	TA-7113 Filter 51 Type & D-86446 Amps.	21-OH
21-ON	2.7	-	500-DC	Ampl.	21-ON
21-OP	1.35	1.00	500-DC	74 Type Amp.	21-OP
21-QD	2.14	2.10	500-DC	706 Type C.C.	21-QD
57-A	2.70	2.00	500-DC	8 Type Amps. 203, 518 Type & D-85125 Panels	57-A
57-B	1.35	1.00	500-DC	8 Type Amps. D-85125, D-86449 & TA-108 Panels	57-B
57-F	0.675	0.50	500-DC	211 Type Panel	57-F
57-AD	-	0.01	1000-AG	708 Type C.C.	57-AD
57-AK	1.15	1.00	1000-AG	8 Type Amps.	138-A
57-AL	(Cap. adjusted as req.)	-	500-DC	8 Type Amps. D-81778 Equalizer	57-AK
57-AS	0.34	0.25	1000-AG	8 Type Amps.	57-AL
76-AS	0.03434	0.034	500-DC	7A-7219 Filter	76-AS

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Condenser Code No.	Capacity (MF)		Test Voltage	Apparatus Used in	Replacement Code No.
	Max.	Rated			
169-C	30.00	-	1400-DC	709 Type C.C.	169-B
180-A	1.15	1.00	4000-DC	43 Type Ampl.	180-A
181-A	1.15	1.00	2000-DC	25, 32, 34, 41, 42, 46, 51, 57, 59 Type & D-85146 Type Ampl.	181-A (See Note: 2)
				243, 244, 245 Type Condenser	(See Note: 3)
182-A	0.575	0.5	2000-DC	TA-7113 Filter 243 Type Condenser (See Note: 4)	182-A (See Note: 4)
221-A	1.15	1.00	2000-DC	25, 32, 34, 41, 42, 46, 51, 59, 62, 63 Type & TA-7246 Ampl.	221-A (See Note: 3)
222-A	0.575	0.500	2000-DC	243, 244, 245 Type Condenser TA-7113 Type Filter 27 Type Ampl.	222-A (See Note: 4)
225-A	1.15	1.00	4000-DC	713 Type C.C.	225-A
243-A	3.58	3.55	2000-DC	TA-7248 Type Ampl.	D-89559
243-B	3.45	3.50	2000-DC	203 Type Repro. Set	D-91000
244-A	2.04	2.09	2000-DC	203 Type Repro. Set	D-89562
245-A	5.65	5.60	2000-DC	203 Type Repro. Set	D-91001
KB-6108	0.005	Var.	250-AC	701 Type & D-81630 Cont. Cab.	KB-6108
KB-6251	0.01	0.006	500-DC	47, 48, 53 & 54 Type Amps.	KB-6251 (Faradon .006 MF)
KB-7150	-	900.0	-	5 Type & KB-7146 Current Supply Set	KB-7150
D-48560	0.30	-	500-DC	706 Type C.C.	D-48560
D-48561	0.50	-	500-DC	708 Type C.C.	D-48561
D-85073	0.0084	0.0083	2500-AC	700 Type C.C.	D-85073
D-86779	0.45	0.40	500-DC	47, 48, 53, & 54 Type Amps.	D-92256 (See Note: 5)
D-87723	0.209	0.203	500-DC	7 Type Equalizer	D-87723
D-89213	0.10	0.197	500-DC	7, 54 Type Ampl.	D-89213
D-89214	38.00	37.50	1400-DC	709 Type C.C.	169-B
D-89219	3.63	3.28	1400-DC	203 Type Repro. Set	D-89219
D-89220	3.22	3.23	1400-DC	203 Type Repro. Set	D-89220
D-89221	2.92	2.57	1400-DC	203 Type Repro. Set	D-89221
D-89222	2.14	2.09	1400-DC	203 Type Repro. Set	D-89222
D-91000	3.22	3.20	1400-DC	203 Type Repro. Set	D-91000
D-91001	3.22	3.20	1400-DC	203 Type Repro. Set	D-91001
D-91578	2.61	2.58	2000-DC	203 Type Repro. Set	D-89229
D-91579	2.14	2.09	2000-DC	203 Type Repro. Set	D-89229
D-91580	3.22	3.20	2000-DC	203 Type Repro. Set	D-91001
D-91581	3.65	3.60	2000-DC	203 Type Repro. Set	D-91001
D-92256	0.625	0.50	500-DC	47, 48, 53 & 54 Type Amps.	D-92256 (See Note: 5)
D-92563	1.15	1.00	2000-DC	51 Type & D-88446 Ampl.	D-92563 (See Note: 2)

Condenser Code No.	Capacity (MF)		Test Voltage	Apparatus Used in	Replacement Code No.
	Max.	Rated			
76-BS	0.02707	0.0268	500-DC	TA-7225 Filter	76-BS
76-ZL	0.04832	0.04808	500-DC	TA-7225 Filter	76-ZL
76-EP	0.00701	0.00698	500-DC	D-85128 Equalizer	76-EP
76-EW	0.06553	0.06520	500-DC	TA-7225 Filter	76-EW
76-FD	0.06995	0.06960	500-DC	TA-7219 & TA-7225 Filter	76-FD
76-FK	0.06161	0.06130	500-DC	TA-7219 Filter	76-FK
76-FW	0.01549	0.01541	500-DC	D-86353 Equalizer	76-FW
87-B	1.20	1.00	250-DC	D-85943, D-86729 & 50 Type Ampl.	87-B
95-D	1.15	1.00	4000-DC	43 Type Ampl.	95-D
129-A	0.01	0.006	500-DC	519 Type Panel 6 Type & D-86353 Equalizer	129-A
137-A	5.00	4.00	500-DC	57, 59, 62, D-94531, TA-7246 & TA-7248 Type Ampl.	137-A
				D-94852 Control Unit D-94813, D-94813-A D-94814 & D-94867 Filament	
138-A	1.25	-	1000-AC	D-95184 & TA-7245 Coupling Network 8, 69, 80 & D-94531 Type Ampl.	138-A
138-B	1.57	1.25	1000-AC	D-94813 Filter D-94813 & D-94813-A Filter	138-B
139-A	2.50	2.00	500-DC	D-95184 Coupling Network D-94531 Ampl.	139-A
140-B	0.62	0.50	1000-AC	700 Type Appr. Unit 713 Type C.C.	140-B (713 Type C.C.)
141-A	1.25	1.00	500-DC	69 Type & TA-7246 Ampl.	141-A
141-B	0.625	0.50	500-DC	57, 59, 62, 63 Type, D-94531 & TA-7248 Ampl.	141-B (713 Type C.C.)
141-C	0.625	0.50	500-DC	713 Type C.C.	141-C
141-F	0.50	0.50	500-DC	57, 62 Type & TA-7246 Ampl.	141-F
142-B	0.32	0.25	1000-AC	713 Type C.C.	142-B
147-A	2.50	2.00	500-DC	(See Note 2) 700 & 708 Type C.C. 34 Type Sub. Set	147-A
147-B	1.25	1.00	500-DC	(Two units not connected)	147-B
149-A	1.25	1.00	500-DC	See 21-F, 21-K & 21-EW	149-A
149-B	0.62	0.50	500-DC	See 21-AS, 42 & 46 Type Ampl.	149-B
151-A	0.115	0.10	500-DC	41, 49, 50 & D-86729 & D-85943 Type Ampl.	151-A
151-B	0.70	-	1000-AC	41 Type Ampl.	151-B
169-A	38.00	37.00	1400-DC	709 Type C.C.	169-A
169-B	30.00	-	1400-DC	709 Type C.C.	169-B

CONDENSERS, GENERAL EQUIPMENT BULLETIN

Condenser Code No.	Capacity (MF)		Test Voltage	Apparatus Used In	Replace Code No.
	Max.	Rated			
TA-4115	2500	2000	1700	TA-4037, TA-7204 & TA-7213 Filter TA-7205 Junction Box TA-4032, TA-4035, TA-4036, TA-4038 TA-4144 Type Power Units KS-5259 Motor Gen. Set (External Circuit) TA-4030 Filter	TA-4115 (See Sect. 3)
TA-4149	-	200	200	TA-4149 TA-4149	(See Sect. 3)
Aerovox Type E-2 200 V 200 MF	-	200	-	TA-4030 Filter	(See Sect. 3)
Dubilier 24 V 1000 MF	-	1000	-	KS-5259 Motor Gen. (External Circuit)	TA-4115
Dubilier 13 V 2000 MF	-	2000	-	KS-5259 Motor Gen. (External Circuit)	TA-4115
Dubilier #577 (.003 MF)	-	0.003	-	701 Type C.G.	Dubilier #577 (.003 MF)
Sangamo .001	-	.001	-	TA-7246 Ampl.	Sangamo .001
Sangamo .0015	-	.0015	-	49 Type & D-55943 & D-56729 Type Ampl.	Sangamo .0015
Sangamo .002	-	.002	-	TA-7246 Ampl.	Sangamo .002
Sangamo .0025	-	.0025	-	41 Type Ampl.	Sangamo .0025
Sangamo .006	-	.006	-	49, 50, D-55943 & D-56729 Type Ampl.	Sangamo .006
Sangamo .007	-	.007	-	TA-7246 Ampl.	Sangamo .007
Sangamo .01	-	.01	-	49, D-55943 & D-56729 Type Ampl.	Sangamo .01
Sangamo .012	-	.012	-	62 Type Ampl.	Sangamo .012

NOTES: 1. The 95, 180, 181, 182, 243, 244 and 245 type Condensers have no mounting lugs, and are strap mounted. The 21, 147 and 149 type Condensers have small lugs, but are, in general, strap mounted. The 57, 106, 54, 129, 151 and 169 type Condensers have heavy mounting lugs. The 137, 138, 139, 140, 141, 142, 221, 222, and 223 type Condensers will be used for panel or bracket mounting. Condenser 1, 708 type Condensers will be used for replacements of the 21-40 Condenser in 708 type Condensers when existing stocks of the latter condenser are exhausted at which time the field will be advised.

2. The 181-A Condenser will be replaced by the 221-A Condenser when existing stocks of the former are exhausted at which time the field will be advised.

3. The 182-A Condenser will be replaced by 222-A Condenser when existing stocks of the former are exhausted at which time the field will be advised.

4. The D-92583 Condenser has the same capacity and a higher breakdown voltage than the 21-08 Condenser and should be used as a replacement for the 21-08 Condenser in all cases.

5. The D-92583 Condenser replaces the D-56779 Condensers in the 53 type Amplifier and one D-56779 Condenser in the 47, 48 and 54 type Amplifiers.

2. 21-08, 181-A and D-92583 Condensers

2.1 The D-92583 Condenser has the same capacity and a higher breakdown voltage than the 21-08 Condenser and should be used as a replacement for the 21-08 Condenser in all cases.

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2.11 On the 42-A Amplifier, if one or more of the 21-08 Condensers in the Filter Bank (C-1 to C-5 inc.) become defective, replace the whole group by eight D-92583 Condensers.

2.12 On the 46 type Amplifier, if one or more of the 21-08 Condensers in the Filter Bank (C-6 to C-11 inc.) become defective, replace the whole group by six D-92583 Condensers, also change the amplifier wiring, as described in E.S. Amplifiers, 46 Type, P.R. 4, 03, to permit emergency operation in case of possible future filter condenser trouble. Report on 21-08 Condenser stock cases to the Bureau of the H. O. R. Division. Report as an equipment change (See Form 33, P. 4, O.R.) all 42 or 46 type Amplifier Filter Bank Condenser replacements in accordance with the above.

2.2 Interruptions in Performance, due to condenser failure in 42 and 46 type Amplifiers should be practically eliminated by a complete replacement of the 21-08 Condensers by D-92583 Condensers. The cost is relatively small, and from the customer's standpoint, the change should be very desirable. THE COMPANY CONDENSER REPLACEMENT (EVEN IF NO TROUBLE HAS YET BEEN EXPERIENCED) IN THE 42 AND 46 TYPE AMPLIFIERS IS AN INSURANCE AGAINST PROGRAM INTERRUPTION, SHOULD BE POINTED OUT TO CUSTOMERS.

2.3 The 181-A Condenser, electrically the same as the D-92583 Condenser, but smaller in dimensions, is now used in the manufacture of all apparatus formerly provided with 21-08 Condensers. The smaller size of the 181-A Condenser makes it unsuitable for field replacements of 21-08 Condensers.

3. "Dry" Electrolytic Condensers

3.1 Description: The KS-7160 Condenser, and the first five condensers listed on Page 4 are of the "dry" electrolytic type. The essential characteristics of two aluminum foil electrodes separated by 21-08 or paste electrolyte are impregnated with an electrolyte in paste form. The elements are wound in a manner similar to the dry paper condensers and enclosed in a metal case. Some absorbent material, such as cork, fills the spaces between the condenser and container. Some types of "dry" electrolytic condensers are sealed so that they are watertight and may be operated in any position. Other types, such as the TA-4115, are sealed with asphaltum, which is effective in retarding evaporation, but cannot be depended upon to be watertight. It is also considered good practice to provide a vent for relief of expanded air, heating through electrical leakage within the container. Condensers of this type should always be operated in an upright position.

An impressed voltage across the condenser causes a relatively thin and tough film of aluminum oxide (dielectric) to form on the anode. The thickness of the dielectric film is proportional to the initial or forming potential applied to the anode. The capacity is inversely proportional to the thickness of the film and consequently, also to the forming voltage.

3.2 The KS-7160, TA-4115, and TA-4149 Condensers are dry electrolytic condensers now standard for use in T.E.S.R. Equipment as shown in the list in Sect. 1. The TA-4115 Condensers now supplied are of an improved design, identifiable by aluminum terminal studs and by the manufacturer's marking (479 followed by code numbers) below the code marking.

The TA-4149 Condenser is the same as the Aerovox E-2, 200 V, 200 MF Condenser which it replaces.

3.3 Installation: These condensers are supplied separate from the power units, and are installed in which they are used. See electrical specifications and wiring diagrams for such power units, filters, etc. on the M.G. System Drawings. Scratch installation date plainly (installed (date)) on each electrolytic condenser, as in time, these condensers dry out with resultant reduction in capacity making their replacement necessary.

3.4 Maintenance

3.41 Unused dry electrolytic condensers require reforming after every three months of idleness, except the improved TA-4115 Condenser which can go for six months without reforming. This applies both to condensers in equipment out of operation, and to spare condensers at installations in operation.



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3.42 Reforming procedure for condensers in equipment out of operation:— Turn on the power supply to the equipment containing or associated with the condensers. No external load is necessary. In the case of a 2000 MF condenser such as the TA-4115 which has been out of service for a considerable time, a leakage current of more than one ampere may flow during the first few seconds of reforming, but should decrease to approximately .10 ampere in 15 seconds, to approximately .02 ampere in five minutes and thereafter very slowly. Condensers of this type show a wide variation in their leakage currents but are considered satisfactory if the leakage current at the forming potential does not exceed .005 ampere per 1000 MF. The time required to reach this limit will depend somewhat upon the time the condenser has been idle and may be from 8 to 24 hours. A Weston #250 Voltmeter connected between one terminal of the condenser and its associated terminal spring (in series with the condenser) may be used for the current measurements. Provision should be made to short circuit the voltmeter in order to bypass the initial rush of current through the condenser. Spare condensers at installations out of operation should be reformed at the same time, as described in 3.43 below.

3.43 Reforming procedure for spare condensers at installations in operation:— Connect all such spare condensers in parallel with one of the condensers in use, (except the condenser in a power unit signal circuit) during regular operation, for such time as required for the results indicated in 3.42 above.

3.44 Condensers which leak an excessive amount of electrolyte or operate considerably warmer than other condensers in the same ambient temperature will result in an excessive breakdown of the anode film. The leakage current of such condensers should be measured as described above. If the condenser has been in service without being reformed, the leakage current should reach the limit of .005 ampere per 1000 MF within 15 minutes. If this value is not reached in two hours, however, then the condenser should be considered unsatisfactory and should be replaced. Excessive current leakage, rather than leakage of electrolyte in itself, should be considered as the basis and reason for replacement. The electrolyte may be removed from the outside of the condenser by the use of a damp cloth.

3.45 The capacity may be reduced by drying of the electrolyte due to high ambient temperature, to gradual evaporation of the moisture in the electrolyte through long service or to the operation of the condenser through long service or to the operation of the condenser through long service. The capacity is inversely proportional to the thickness of the film and consequently, also to the forming voltage. A TA-4147 Test Ister connected between the one terminal of the condenser and its associated terminal spring (in series with the condenser) may be used for the current measurements. Provision should be made to short circuit the voltmeter in order to bypass the initial rush of current through the condenser. Spare condensers at installations out of operation should be reformed at the same time, as described in 3.33 below.

4. Merchandising

- 4.1 Order replacement condensers by code number in accordance with the table, e.g. "One 21-H Condenser".
- 4.2 Order D-9253 Condensers in the regular way on an S.D. Order. They may be supplied immediately from the Emergency Material Parts Kits (See O.B. #10, R.N. 814). All 42 and 46-type Amplifiers shipped from either the #10, Division or Emergency Stocks are equipped with D-9253 Condensers instead of 21-OB Condensers in the Filter Circuit Bank

1. "DRY" ELECTROLYTIC CONDENSERS

1.1 Description: The condensers listed in E.B. "Condensers, Data Chart", File 4.05 with the letter (S) beside the rated capacity, are of the "dry" electrolytic type, and consist essentially of two aluminum foil electrodes separated by cloth or paper spacers which are impregnated with an electrolyte in paste form. The elements are wound in a manner similar to the dry paper condensers and enclosed in a metal case. Some absorbent material, such as cork, fills the spaces between the condensers and contained in any position. Other types of electrolytic condensers are available in any position. The TA-4115 was sealed with asphaltum, which is effective in retarding evaporation, but not necessarily water-tight. Such condensers may not remain completely sealed, or may have a vent for relief of internal pressure and should always be operated in an upright position.

An impressed voltage across the condenser causes a very thin film of aluminum oxide (dielectric) to form on the anode. The thickness of the dielectric film is proportional to the initial or forming potential applied to the anode. The capacity is inversely proportional to the thickness of the film and consequently, also to the forming voltage.

1.2 Installation: When these condensers are supplied separate from the power units, filters, etc. in which they are used, install them, observing proper polarity, as specified on the wiring diagrams for such power units, filters, etc. Scratch installation date plainly ("Installed (date)") on each electrolytic condenser, as in time these condensers dry out or increase in internal resistance, thus reducing their effective capacity and making their replacement necessary.

1.3 Maintenance

1.31 Unused dry electrolytic condensers of the low voltage types used in power units, current supply sets, etc. require reforming after every three months of idleness, except the improved TA-4115 Condenser (identifiable by aluminum finish can and aluminum terminal studs) which can go for six months without reforming. This applies both to condensers in equipment for the high voltage type gas in the D-96101 Filter, 86 type Amplifier, etc. should be reformed once each year, only if not installed in the apparatus. The reforming may be omitted on such condensers, if they are installed.

1.32 Reforming procedure for condensers in equipment out of operation: Turn on the power supply to the equipment containing or associated with the condensers. No external load is necessary. In the case of a 2000 MF condenser such as the TA-4115 which has been out of service for a considerable time, a leakage current of more than one ampere may flow during the first few seconds of reforming, but should decrease to approximately .10 ampere in 15 seconds, to approximately .02 ampere in five minutes, and thereafter very slowly. The following table indicates satisfactory leakage current for condensers of different capacities and voltages. While these limits are in general satisfactory, they are not necessarily used as a basis for rejection unless the operation of the associated equipment is affected.

Leakage Current per MF	Hours of Reforming
0.005	After 8 to 24 hours
0.015	After 8 to 24 hours
0.10 to 0.25	After 8 to 24 hours

Voltage	Capacity (MF.)
0 to 75	500 and above
75 to 500	75 to 500
200 to 600	75 to 500

A TA-4147 Test Ister connected between the one terminal of the condenser and its associated terminal spring (in series with the condenser) may be used for the current measurements. Provision should be made to short circuit the voltmeter in order to bypass the initial rush of current through the condenser. Spare condensers at installations out of operation should be reformed at the same time, as described in 1.33 below.

1.33 Reforming procedure for spare condensers at installations in operation: Connect all such spare condensers in parallel with one of the condensers in use (except the condenser in a power unit signal circuit) during regular operation, for such time as required for the results indicated in 1.32 above.

1.34 Condensers which leak an excessive amount of electrolyte or operate considerably warmer than other condensers in the same ambient temperature are a potential source of trouble in the sound system, substitute a known satisfactory condenser in the circuit affected. Since the leakage current increases very rapidly with small increases in potential, substitute condensers which have similar voltage at the condenser terminals.

1.35 The capacity may be reduced by drying of the electrolyte due to high ambient temperature, to gradual evaporation of the moisture in the electrolyte through long service or to the operation of the condenser through long service or to the operation of the condenser through long service. The capacity is inversely proportional to the thickness of the film and consequently, also to the forming voltage. A TA-4147 Test Ister connected between the one terminal of the condenser and its associated terminal spring (in series with the condenser) may be used for the current measurements. Provision should be made to short circuit the voltmeter in order to bypass the initial rush of current through the condenser. Spare condensers at installations out of operation should be reformed at the same time, as described in 1.33 below.



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FILING NOTE: Replacing E.B. "Condensers, General", File 4.05

1. GENERAL INFORMATION ON CONDENSERS

Table with columns: Condenser Code No., Capacity (MF) Max./Rated, Test Voltage, Apparatus Used In, Replacement Code No., Issue #1. Rows include various condenser models like 21-D, 21-E, 21-F, etc.

4.05

CONDENSERS, DATA CHART

Table with columns: Condenser Code No., Capacity (MF) Max./Rated, Test Voltage, Apparatus Used In, Replacement Code No., Issue #1. Rows include various condenser models like 138-A, 138-B, 139-A, etc.



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Condenser Code No.	Capacity (MF)	Test Voltage	Apparatus Used In	Replacement Code No.
Aerovox type 1455	0.03	1000-A0	TA-7300 Apparatus Unit in A-41-C Amplifier	1455 - .03 MF
Aerovox type 1455	0.5	-	D-9464B-B Reproducer Set	A-2431 - 5000 0.5 MF
Aerovox type 1455	8.0 (E)	525-DC	D-94531 & D-95036 type Amplifiers	E-5-S
Aerovox type 1455	8.0 (E)	-	86 type Amplifier	332-150 - 3-S-S MF
Aerovox type 1455	8.0 (E)	525-DC	D-96101 Filter	I-5-S
Aerovox type 1455	8.0 (E)	-	716-A Apparatus Unit 86 type Amplifier	I-6-S
Aerovox type 1455	200 (E)	-	TA-4030 Filter	TA-4149
Aerovox type 1455	2000 (E)	-	TA-7252 Filter	E-24 - 2000 MF
Dubilier, type 577	0.003	1000-A0	701 type Cont. Cab.	Dubilier, type 577, 1003 MF, 1003 MF
Dubilier, type 577	0.1	-	TA-7310 Amplifier	Dubilier, type 577, 1003 MF, 1003 MF
Dubilier, type 577	1.0	-	TA-7310 Amplifier	Dubilier, type 577, 1003 MF, 1003 MF
Dubilier, type 577	1000 (E)	-	K8-5259 Motor Gen. (External circuit)	TA-4115
Dubilier, type 577	2000 (E)	-	K8-5259 Motor Gen. (External circuit)	TA-4115
Holmes, type 1448	0.5	-	TA-4050 & TA-4053 Reproducer Sets	HC-1087
Jensen, type 1180	-	-	TA-4151 Loudspeaking	1180
Jensen, type 1180	4.0	-	TA-4151 Loudspeaking	1180
Jensen, type 1180	.00025	300-DC	D-49-C, D-85943-D & D-86729-D Amps.	B-3 - with .00025 MF
Sanguo, B-3	0.001	500-DC	D-49-C, D-85943-D & D-86729-D Amps.	B-3 - with .001 MF
Sanguo, B-3	0.005	300-DC	49-C, D-85943-D & D-86729-D Amps.	B-3 - with .005 MF
Sanguo, B-3	0.006	1000-DC	49, 50, D-85943 & D-86729-D Amps.	A-10 - .006 MF
Sanguo, B-3	0.007	1000-DC	TA-7246 & TA-7261 type Amplifiers	A-10 - .007 MF
Sanguo, B-3	0.012	1000-DC	62 type Amplifiers	A-10 - .012 MF

Condenser Code No.	Capacity (MF)	Test Voltage	Apparatus Used In	Replacement Code No.
K8-6108	0.005	250-AC	701 Type & D-81630 G.C. Amplifiers	K8-6108
K8-6251	0.01	500-DC	47, 48, 53 & 54 type	K8-6251
K8-7146	900.0 (E)	30-DC	5 type & K8-7146 & D-94813 Current Supply Sets	MA-3937-1
K8-7617	1000 (E)	500-DC	12-A Rectifier	K8-7617
D-48560	0.30	500-DC	706 type Control Cabinet	D-48560
D-48561	0.50	500-DC	708 type Control Cabinet	D-48561
D-5073	0.081	500-DC	700 type Control Cabinet	D-5073
D-56773	0.45	500-DC	47, 48, 53 & 54 type Ampl.	D-56773
D-5723	0.209	500-DC	7 type Equalizer	7-A Equalizer
D-59213	0.10	500-DC	53, 54 type Amplifiers	152-B
D-89334	38.00	1400-DC	709 type Control Cabinet	163-B
D-89559	3.63	1400-DC	203 type Reproducer Set	D-89559
D-89560	3.48	1400-DC	203 type Reproducer Set	D-91000
D-89561	3.27	1400-DC	203 type Reproducer Set	D-91001
D-91000	3.48	1400-DC	203 type Reproducer Set	D-91000
D-91001	3.50	1400-DC	203 type Reproducer Set	D-91001
D-91878	3.63	2000-DC	203 type Reproducer Set	D-89559
D-91879	2.14	2000-DC	203 type Reproducer Set	D-89562
D-91880	3.55	2000-DC	203 type Reproducer Set	D-91000
D-91881	5.65	2000-DC	203 type Reproducer Set	D-91001
D-92256	0.852	500-DC	47, 48, 53 & 54 type Amplifiers	D-92256
D-92583	1.15	2000-DC	25, 26, 27, 43, 44, 46, 47, 48, 53 & D-8646 Amps.	(Note 3)
D-94958	2.30	1000-DC	708 & D-8651 G.C.	D-7593
D-95008	3.45	500-DC	D-95036 type Amplifiers	(Note 2)
D-95009	0.115	1000-AC	D-95036 type Amplifiers	288-A
D-95010	2.30	500-DC	D-95036 type Amplifiers	291-A
D-95709	0.115	500-DC	(see 151-A Condenser)	D-95709
HC-1087	0.5	1000-DC	D-49-C Amplifier	HC-1087
MA-10837-1	900.0 (E)	30-DC	5 type & K8-7146 & D-94813 Current Supply Sets	MA-10837-1
TA-4115	2300	2000 (E)	TA-4037, TA-7204 & TA-7213 Filters	TA-4115
TA-4149	200 (E)	200	TA-7205 Junction Box	TA-4149
Aerovox type 1455	0.0040	0.00035	TA-4038, TA-4035, TA-4036 type Amplifier	1455 min. .00035
Aerovox type 1455	0.0040	0.00035	TA-4038, TA-4035, TA-4036 type Amplifier	max. .00040
Aerovox type 1455	0.00035	1000-AC	K8-5259 Motor Generator Set (External Circuit)	rated .00035 MF
Aerovox type 1455	0.0006	1000-AC	TA-7304 Apparatus Unit in A-86-A Amplifier	1455 - .0006 MF
Aerovox type 1455	0.0024	0.0016	TA-7246-A Amplifier	1455 - .002 MF
Aerovox type 1455	0.0012	1000-AC	TA-7304 Apparatus Unit in A-41-C Amplifier	1455 - .0012 MF
Aerovox type 1455	0.0023	0.015	TA-7246-A Amplifier	1455 - .015 MF
Aerovox type 1455	0.02	1000-AC	TA-7304 Apparatus Unit in A-86-A & C-36-A Amps.	1455 - .02 MF

NOTES: 1. The 95, 180, 181, 182, 243, 244 and 245 type Condensers have no mounting lugs, and are "strap mounted". The 21, 147 and 149 type Condensers have small lugs, but are in general, "strap mounted". The 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231 and 232 type have mounting studs for panel or bracket mounting.

2. The D-92563, 181-A and 221-A Condensers are electrically equivalent. The D-92563 is for use as a replacement for the 21-CB Condenser, and has been extensively used for this purpose in the filter circuits of 42 and 46 type Amplifiers (see E.B.'s Amplifiers, 42 type, and Amplifiers, 46 type, File 4.05).

3. The D-92563, 181-A and 221-A Condensers are electrically equivalent. The D-92563 is for use as a replacement for the 21-CB Condenser, and has been extensively used for this purpose in the filter circuits of 42 and 46 type Amplifiers (see E.B.'s Amplifiers, 42 type, and Amplifiers, 46 type, File 4.05).

4. The D-92563, 181-A and 221-A Condensers are electrically equivalent. The D-92563 is for use as a replacement for the 21-CB Condenser, and has been extensively used for this purpose in the filter circuits of 42 and 46 type Amplifiers (see E.B.'s Amplifiers, 42 type, and Amplifiers, 46 type, File 4.05).

5. Order replacement condensers by code number in accordance with the last column of the table, e.g., "One 21-H Condenser".

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 Electrical Research Products Inc.
 Operating Engineering Dept. - Equipment Div.
 Issue #1
 October
 5, 1935



CONDENSERS, DATA CHART
APPENDIX #1

This sheet lists all the condensers used in Sound Reproducing Equipment not already listed in "Condensers, Data Chart, Issue #1, dated October 5, 1935."

Table with columns: Condenser Code No., Max. Capacity (uF), Test Voltage, Apparatus Used In, Replacement Code No.

NOTE: 1. Electrolytic condensers are designated by the letter (E) following the rated capacity. All condensers so designated are "Dry" Electrolytic.