ELECTRICAL PENETRATION PROTECTION POWER CIRCUITS

(PRIMARY AND SECONDARY)

NORTH ANNA POWER STATION - UNIT 2

VIRGINIA ELECTRIC AND POWER COMPANY

STONE & WEBSTER ENGINEERING CORPORATION

BOSTON, MASSACHUSETTS

REVISION NO. 1 9/22/80

STONE & WEBSTER ENGINEERING CORPORATION
CALCULATION SHEET

Page No. SH 1

Client VEPCO Location NA-2 Sub. No.

Subject or Apparatus PENETRATION PROTECTION Date 1-7-80 By

Checked 1-7-80 By

Sheet No. Revised By

REV 1 JPW 2-7-80
RLW 2-8-80

POSITION	PENETRATION TYPE	CONDUCTOR	LOAD	TIME-CURRENT CURVE 12050-SK	FULL LOAD AMPS	PRIMARY PROTECTIVE DEVICE	NOTES & COMMENTS	SECONDARY PROTECTIVE DEVICE	NOTES & COMMENTS
1A-2	VA	1000MCM	Reactor Coolant Pump (2-RC-P-01B)	VA-1	1115/891	Relay 121A66B3A	Controls Breaker Positions 25B3	Relay IAC66B	Controls Breaker Position 25B2 or 2501
1B-2	VA	2/C per phase							
1C-2	VA	1000MCM	Reactor Coolant Pump (2-RC-P-01C)	VA-1	1115/891	Relay 121A66B3A	Controls Breaker Positions 25C3	Relay IAC66B	Controls Breaker Position 25C2 or 2501
1D-2	VA	2/C per phase							
1E-2	VB	1000MCM	Residual Heat Removal Pp (2-RH-P-01A)	VB-1	40	Relay 121AC68B3A	Controls Breaker Positions 25E14	Relay IAC53A	Control Breaker Position 25E12
2A-2	IID	250MCM	Refueling & Maint.	N/R	N/R	Breaker Normally Open		N/R	
2B-2	IID	2/C per phase							
2E-2	IID	4/0 MCM 2/C per phase	Aux'lr. Spray Pmp. (Inside) (2-RS-P-01A)	IID-1	138	Brkr With DD-6 450A Coil LTD-160% Min., Inst - 1200%		Brkr with DD-6 450A Coil LTD-100% Min., Inst - 1200%	
2V1-2	IC	10 AWG	a. Reactor Cavity Manip Crane (2-MH-CR-5)	N/R	N/R	Breaker Normally Open		N/R	
			b. Fuel Transfer Control Cab (2-FH-CB-92)	N/R	N/R	Breaker Normally Open		N/R	
			c. RCC Fixture Change Motor (2-MC-M-13)	N/R	N/R	Breaker Normally Open		N/R	
3A-2	IIE	2 & 6 AWG	Full Length Rods - Lifters	IIE-1	50	Fuse Shawmut A25X50	Typical	Breaker GE THED 60A	
			Full Length Rods - Grippers	IIE-2	10	Fuse Bussman FRX-10	Typical	Breaker GE THED 40A	
3B-2	IIE	2 & 6 AWG	Full Length Rods - Lifters	IIE-1	50	Fuse Shawmut A25X50	Typical	Breaker GE THED 60A	
			Full Length Rods - Grippers	IIE-2	10	Fuse Bussman FRX-10	Typical	Breaker GE THED 40A	
3C-2	IIE	2 & 6 AWG	Full Length Rods - Lifters	IIE-1	50	Fuse Shawmut A25X50	Typical	Breaker GE THED 60A	
			Full Length Rods - Grippers	IIE-2	10	Fuse Bussman FRX-10	Typical	Breaker GE THED 40A	
3D-2	IIE	2 & 6 AWG	Full Length Rods - Lifters	IIE-1	50	Fuse Shawmut A25X50	Typical	Breaker GE THED 60A	
			Full Length Rods - Grippers	IIE-2	10	Fuse Bussman FRX-10	Typical	Breaker GE THED 40A	

STONE & WEBSTER ENGINEERING CORPORATION
CALCULATION SHEET

Page No. SH 2

Client: VEPCO Location: NA - 2
Subject or Apparatus: PENETRATION PROTECTION
Date: 1-7-80 By: [illegible]
Checked: 1-7-80 By: [illegible]

REV 1 [illegible] 2-7-80
RLW 2-8-80

POSITION	PENETRATION TYPE	CONDUCTOR	LOAD	TIME-CURRENT CURVE 12050-SE	FULL LOAD AMPS	PRIMARY PROTECTIVE DEVICE	NOTES & COMMENTS	SECONDARY PROTECTIVE DEVICE		NOTES & COMMENTS
3E-2	IIE	2 & 6 AWG	a. Full Length Rods - Lifters	IIE-1	50	Fuse Shawmut A25X50	Typical	Breaker GE THED	60A	
			Full Length Rods - Grippers	IIG-2	10	Fuse Bussman FNK-10	Typical	Breaker GE THED	40A	
			b. RC Heat Tracing Dist Pnl (2-EP-CB-800 A)	IIE-3	-	Breaker G.E. TEB 30A		Breaker GE THED	40A	
			c. RC Heat Tracing Dist Pnl (2-EP-CB-800 B)	IIE-3	-	Breaker G.E. TEB 30A		Breaker GE THED	40A	
4A-2	IIA	8 AWG	a. Containment Air Compressor (2-IA-C-02A)	IIA-1	19.5	Breaker NZM-6 50-500A with Z2-33-NA OL Heater (Note 1)	Note 1: OL Heater Set @ 30 ± 2 Amps (or Z2-40-NA or Z2-40/E-NA)	Breaker GE THED	35A	
			b. Loop 3 Hot Leg Stop Vv (MOV-2594)	IIA-2	26	— DO —		--DO--		
			c. Loop 3 Cold Leg Stop Vv (MOV-2595)	IIA-2	26	— DO —		--DO--		
			d. RHR Outlet Vv (MOV-2720A)	IIA-1	20	— DO —		--DO--		
			e. Acc. Tank Discharge Vv (MOV-2865A)	IIA-1	18.1	— DO —		--DO--		
			f. Acc. Tank Discharge Vv (MOV-2865B)	IIA-1	18.1	— DO —		--DO--		
			g. RC Air Recirc. Fan (2-HV-F-92A)	IIA-1	21	— DO —		--DO--		
4B-2	IIA	8 AWG	a. Loop 2 Hot Leg Stop Vv (MOV-2592)	IIA-2	26	— DO —		--DO--		
			b. Loop 2 Cold Leg Stop Vv (MOV-2593)	IIA-2	26	— DO —		--DO--		
4C-2	IIC	2/0	a. Control Rod Drive Mech Fan (2-HV-F-37A)	IIC-2	92	Breaker NZM-9 130-2000A with Z4-130-NA OL Heater (Note 2)	Note 2: OL Heater Set @ 120% 10 Amps	Breaker GE THED	100A	
			b. Power Receptacle	IIC-4	-	Breaker NZMH-9 60-800A		Breaker GE THED	100A	
			c. RC Air Recirc. Fan (2-HV-F-01A)	IIC-1	240	Breaker with OD-6 300A coil LTD 100% Min. (or Inter) Inst 1200%		Breaker with OD-6 300A coil LTD 100% Min. (or Inter) Inst 1200%		

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STONE & WEBSTER ENGINEERING CORPORATION
CALCULATION SHEET

Page No. 2
Preliminary
Rev.

Client: VEPCO — Location: NA-2 — J.O. No. 12050

Subject or Application: PENETRATION PROTECTION — Date 1-7-80 — By [signature]

Checked 1-7-80 — By [signature]

Based on: — Revised — By

REV 1 RPW 2-7-80
RLW 2-8-80

Rev. 2 TRC 9-22-80
RPW 9-22-80

PENETRATION POSITION	PENETRATION TYPE	CONDUCTOR	LOAD	TIME-CURRENT CURVE 12050-SK	FULL LOAD AMPS	PRIMARY PROTECTIVE DEVICE	NOTES & COMMENTS	SECONDARY PROTECTIVE DEVICE	NOTES & COMMENTS
4D-2	IIC	2/0	a. RC Air Recirc Fan (2-HV-F-01C)	IIC-1	240	Breaker with OD-6, 300A coil LTD-100% Min (or INTER) Inst 1200%		Breaker with OD-6, 300A coil LTD-100% Min. (or INTER) Inst 120%	
			b. Control Rod Drive Mech Fan (2-HV-F-37B)	IIC-2	92	Breaker KDM-9 130-2000A with Z4-130-MA OL htr	See Note 2 sh 2	Breaker GE THED 100A	
			c. Steam Generator Support Heater (Heater Bank C-1)	IIC-3	50.2	Breaker Westinghouse EHB-3070		Breaker GE THED 100A	
4E-2	IIC	2/0	a. Steam Generator Support Heaters	IIC-3					
			(1) Heater Bank A-3		50.2	Breaker Westinghouse EHB-3070		Breaker GE THED 100A	
			(2) Heater Bank B-3		50.2	-- DO --		--DO--	
			(3) Heater Bank C-3		50.2	-- DO --		--DO--	
			b. Control Rod Drive Mech Fan (2-HV-F-37C)	IIC-2	92	Breaker KDM-9 130-2000A with Z4-130-MA OL htr	See Note 2 sh 2	Breaker GE THED 100A	
5B-2	IIB	4 AWG	Pressurizer Heaters	IIB-4	68(Note 3)	Fuse Chase Shawmut OTS-70	Typical	Fuse Chase Shawmut OTS-70	
5C-2	IIB	4 AWG	a. Pressurizer Heaters	IIB-4	68(Note 3)	Fuse Chase Shawmut OTS-70	Typical	Fuse Chase Shawmut OTS-70	
			b. Elevator (Note 6)	—	—	—		----	
5D-2	IIB	4 AWG	a. Pressurizer Heaters	IIB-4	68(Note 3)	Fuse Chase Shawmut OTS-70	Typical	Fuse Chase Shawmut OTS-70	
			b. Elevator (Note 6)	—	--	--		--	
5E-2	IIB	4 AWG	a. Elevator (Note 6)	—	—	—		--	
			b. Elevator	IIB-2	30(Note 6)	Breaker NZMH-9 50-800A		Breaker GE THED 45A	
			c. Power Receptical	IIB-1	-	Breaker NZMH-9 60-800A		Breaker GE THED 60A	
			d. Lighting Pnl 19-2	IIB-5	12kw	Breaker Westinghouse EHB-3060		Breaker GE THED 60A	NOTE 4
			e. Lighting Pnl 44-2	IIB-3	3kw	Breaker GE THED 50		Breaker GE THED 45A	
6B-2	IB	14 AWG	Pressurizer Relief Tank (LT-2470)	IB-3	-	Breaker GE TQB 5A		Breaker GE TQB 5A	

Note 3 : Maximum Measured Value

Note 6 : *

Note 4 : In Transformer Secondary

*These penetrations are for a series connected cable loop for the elevator. The loop is protected by a NZMH-9 50-800A and GE THED 45A (See curve 12050-SK-11B-2).

Client: VEPCO Location: NA 2 Ex. No. 10 - 12050
Subject or Apparatus: PENETRATION PROTECTION Date 1-7-80 By [illegible]
Checked 1-2-80 By [illegible]
Based on: Revised: By:

REV 1 PfN 2-7-80
RLW 2-8-80

Rev. 2 TPC 9-22-80
JRV 9-22-80

PENETRATION POSITION	PENETRATION TYPE	CONDUCTOR	LOAD	TIME-CURRENT CURVE 12050-ES	FULL LOAD AMPS	PRIMARY PROTECTIVE DEVICE	NOTES & COMMENTS	SECONDARY PROTECTIVE DEVICE	NOTES & COMMENTS
11A - 2	1C	10 AWG	a. Part Length Rods	IC-7	-	Fuse Bussman KAW 7A	Typical	Breaker GE THED 20A	
			b. RC Annulus Crane (2-MH-CR-19)	N/R	N/R	Breaker Normally Open		N/R	
			c. Elevator	IC-10	-	Fuse Bussman AGC6		Breaker GE THED 20A	
			d. Elevator	N/R	-	Spare			NOTE 7 - When circuit "D" (elevator spare) is utilized, primary and secondary protection is provided by circuit "C" (elevator normal feed)
			e. Iodine Filter Fan (2-HV-F-03A)	IC-1	4.1	Breaker NZM-6 30-250A with Z2-19.5-NA OL htr and DIL 2V-22-NA Contactor (Note 5)	Note 5 : OL htr set @ 17@3 Amps (or Z2-24/E-NA)	Breaker GE THED 20A	
			f. Reactor Coolant Pp. 1B Bearing Lift Pp. (2-RC-P-01B1)	IC-1	14	— DO —		--DO--	
			g. Reactor Coolant Pp 1B Mtr. Htr. (2-RC-P-01B 2 Htr)	IC-1	3.25	— DO —		--DO--	
			h. RC Sump Pp (2-DA-P-04B)	IC-1	4.2	— DO —		--DO--	
			i. Loop 2 Bypass Stop Vv (MOV-2586)	IC-1	1	— DO —		--DO--	
			j. Neutron Shield Tank Cooling Pp (2-NS-P-01B)	IC-1	1.1	— DO —		--DO--	
			k. RHR Pp Mtr. Htr (2-RH-P-01A Htr)	IC-8	-	Fuse Bussman KTK 1A		Breaker GE THED 20A	
			l. RC Air Recirc Fan Mtr Htr (2-HV-F-01A Htr)	IC-6	-	Fuse Bussman AGC 2.5A		Breaker GE THED 20A	
			m. RC Air Recirc Fan Mtr Htr (2-HV-F-01C Htr)	IC-6	-	Fuse Bussman AGC 2.5A		Breaker GE THED 20A	
			n. Incore Drive Control Pwr	IC-9	-	Fuse Bussman AGC 3/4A	Typical	Breaker GE THED 20A	
11B - 2	1C	10 AWG	a. Part Length Rods	IC-7	-	Fuse Bussman KAW 7A	Typical	Breaker GE THED 20A	
			b. Receptacle - Portable Crane	N/R	N/A	Breaker Normally Open		N/R	
			c. Reactor Coolant Pp 1C Bearing Lift Pp (2-RC-P-01C1)	IC-1	14	Breaker NZM-6 30-250A with Z2-19.5-NA OL Htr, and DIL 2V-22-NA Contactor (Note 5)	See Note 5	Breaker GE THED 20A	
			d. Loop 3 Bypass Stop Vv (MOV-2587)	IC-1	1	— DO —		--DO--	
			e. Neutron Shield Tank Cooling Pp (2-NS-P-01A)	IC-1	1.1	— DO —		--DO--	
			f. Reactor Coolant Pp 1A Bearing Lift Pp (2-RC-P-01A1)	IC-1	14	— DO —		--DO--	
			g. RC Purge System Exh Vv (MOV-HV 200C)	IC-1	2.6	— DO —		--DO--	

STONE & WEBSTER ENGINEERING CORPORATION
CALCULATION SHEET

Page No. SH 5

Client: VEPCO — Location: NA-2 — J.O. No. 12050
Subject or Apparatus: PENETRATION PROTECTION — Date: 1-7-80 — By: [illegible]
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Revised: — By:

REV 1 JPW 2-7-80
RLW 2-8-80

POSITION	PENETRATIONS TYPE	CONDUCTOR	LOAD	TIME-CURRENT CURVE 12050-SK	FULL LOAD AMPS	PRIMARY PROTECTION DEVICE	NOTES & COMMENTS	SECONDARY PROTECTIVE DEVICE	NOTES & COMMENTS
11B-2	IC	10 AWG	h. RC Dump Pp (2-DA-P-4A)	IC-1	4.2	Breaker NZM-6 30-250A with Z2-19.5NA OL htr DIL 2V-22-NA Contactor	See Note 5 sh 4	Breaker GE THED 20A	
			i. Incore Drive Control Pwr	IC-9	-	Fuse Bussman AGC 3/4A	Typical	Breaker GE THED 20A	
11C-2	IC	10 AWG	a. RHR Inlet Vv (MOV-2700)	IC-1	5.3	Breaker NZM-6 30-250A with Z2-19.5-NA OL htr & DIL 2V-22-NA Contactor	See Note 5 sh 4	Breaker GE THED 20A	
			b. Pressurizer Relief Isol Vv (MOV-2536)	IC-1	2.6	-- DO --		--DO--	
			c. Seal Wtr Return Stop Vv (MOV-2380)	IC-1	2.1	-- DO --		--DO--	
			d. Recirc Spray Pp Mtr Htr (2-RS-P-01A Mtr)	IC-8	-	Fuse Bussman KTK 1A		Breaker GE THED 20A	
			e. Instr Air Dryer (2-IA-D-02A)	IC-5	1.25	Breaker GE TB 15A		Breaker GE THED 20A	
			f. Incore Drive	IC-2					
			(1) Drive "A"		4	Breaker NZMH-9 30-500A		Breaker GE THED 30A	
			(2) Drive "B"		4	-- DO --		--DO--	

STONE & WEBSTER ENGINEERING CORPORATION
CALCULATION SHEET

Page No. SH 6
Client VEPCO — NA.-2
Subject or Apparatus: PENETRATION PROTECTION — Date 1-7-80; Checked 1-7-80
REV 1 JPW 2-7-80 RLW 2-8-80

POSITION	PENETRATION TYPE	CONDUCTOR	LOAD	TIME-CURRENT CURVE 1.050-SK	FULL LOAD AMPS	PRIMARY PROTECTION DEVICE	NOTES & COMMENTS	SECONDARY PROTECTIVE DEVICE		NOTES & COMMENTS
12B-2	IIA	4 AWG	Pressurizer Heaters	IIB-4	68(Note 3 sh 3)	Fuse Chase Shawmut OTS-70	Typical	Fuse Chase Shawmut	OTS-70	
12C-2	IIB	4 AWG	a. Pressurizer Heaters	IIB-4	68(Note 3 sh 3)	Fuse Chase Shawmut OTS-70	Typical	Fuse Chase Shawmut	OTS-70	
			b. Steam Generator Support Heater (Heater Bank B-2)	IIB-4	62.7	Fuse Chase Shawmut OTS-70		Fuse Chase Shawmut	OTS-70	
12D-2	IIB	4 AWG	a. Pressurizer Heaters	IIB-4	68(Note 3 sh 3)	Fuse Chase Shawmut OTS-70	Typical	Fuse Chase Shawmut	OTS-70	
			b. Steam Generator Support Heater (Heater Bank C-2)	IIB-4	62.7	Fuse Chase Shawmut OTS-70		Fuse Chase Shawmut	OTS-70	
12E-2	IIB	4 AWG	a. Steam Generator Support Heater	IIB-4						
			(1) Heater Bank A-1		50.2	Fuse Chase Shawmut OTS-70		Fuse Chase Shawmut	OTS-70	
			(2) Heater Bank A-2		62.7	-- DO --		--DO--		
			(3) Heater Bank B-1		50.2	-- DO --		--DO--		
			b. R.C. Stage Basket	N/A	N/A	Breaker Normally Open		N/A		
13A-2	IIE	#16 AWG	Full Length Rods - Lifters	IIE-1	50	Fuse Shawmut A25 X50	Typical	Breaker GE THED	60A	
			Full Length Rods - Grippers	IIE-2	10	Fuse Bussman FRN-10	Typical	Breaker GE THED	40A	
13B-2	IIE	#16 AWG	Full Length Rods - Lifters	IIE-1	50	Fuse Shawmut A25 X50	Typical	Breaker GE THED	60A	
			Full Length Rods - Grippers	IIE-2	10	Fuse Bussman FRN-10	Typical	Breaker GE THED	40A	
13C-2	IIE	#16 AWG	Full Length Rods - Lifters	IIE-1	50	Fuse Shawmut A25 X50	Typical	Breaker GE THED	60A	
			Full Length Rods - Grippers	IIE-2	10	Fuse Bussman FRN-10	Typical	Breaker GE THED	40A	
13D-2	IIE	#16 AWG	Full Length Rods - Lifters	IIE-1	50	Fuse Shawmut A25 X50	Typical	Breaker GE THED	60A	
			Full Length Rods - Grippers	IIE-2	10	Fuse Bussman FRN-10	Typical	Breaker GE THED	40A	
13E-2	IIE	#16 AWG	a. Full Length Rods - Lifters	IIE-1	50	Fuse Shawmut A25 X50	Typical	Breaker GE THED	60A	
			Full Length Rods - Grippers	IIE-2	10	Fuse Bussman FRN-10	Typical	Breaker GE THED	40A	
			b. RC Heat Tracing Dist PNL (2-EP-CB-800C)	IIE-3	-	Breaker GE TEB 30A		Breaker GE THED	40A	
14E-2	IB	14 AWG	a. RC Moisture Analyzer (MA - IM 200)	IB-3	4	Breaker GE TQB 5A		Breaker GE TQB	5A	
			b. Whittaker Ref JB No. 2	IB-1	-	Breaker GE TE 15A		Breaker GE THED	15A	
15A-2	IB	14 AWG	JB for SOV's (JB-190-2)	IB-2	-	Breaker GE THQB 15A		Breaker GE THED	15A	

Client: VEPCO   Location: NA-2   J.O. No. 12050
Subject or Apparatus: PENETRATION PROTECTION   Date: 1-7-80
Checked: 1-7-80

REV 1 TPW 2-7-80
RLW 2-8-80

POSITION	PENETRATIONS TYPE	CONDUCTOR	LOAD	TIME-CURRENT CURVE 12050-SK	FULL LOAD AMPS	PRIMARY PROTECTION DEVICE	NOTES & COMMENTS	SECONDARY PROTECTIVE DEVICE		NOTES & COMMENTS
21B-2	IC	10 AWG	a. Recirc. Spray Pp Mtr Htr (2-RS-P-01B Htr)	IC-8	-	Fuse Bussman KTK 1A		Breaker GE THED	20A	
			b. Whittaker Ref JB No. 1 (JB-675-2)	IC-5	15	Breaker GE TE 15A		Breaker GE THED	20A	
			c. Instr Air Dryer (2-IA-D-02B)	IC-5	1.25	Breaker GE TE 15A		Breaker GE THED	20A	
			d. Cont Rod Drive Dehumidifiers	IC-3	-	Fuse Chase Shawmut OT-15		Breaker GE THED	20A	
			e. Pressurizer Relief Isol Vv (MOV-2535)	IC-1	26	Breaker NZM-6 30-250A with Z2-19.5 MA OL htr & DIL 2V-22-NA Contactor	Typical See Note 5 sh 4	Breaker GE THED	20A	
			f. PRT Inlet Vv (MOV-2701)	IC-1	5	-- DO --		--DO--		
21D-2	IC	10 AWG	a. RG Incore Inst. Rm. Sump Pp (2-DA-P-05)	IC-1	1.4	-- DO --		--DO--		
			b. Primary Drain Transfer Pp (2-DG-P-01A)	IC-1	3	-- DO --		--DO--		
			c. Primary Drain Transfer Pp (2-DG-P-01B)	IC-1	3	-- DO --		--DO--		
			d. Iodine Filter Fan (2-HV-F-01B)	IC-1	4.1	-- DO --		--DO--		
			e. RHR Heat Exchanger Disch Vv (MOV-CC210B)	IC-1	1.3	-- DO --		--DO--		
			f. RC Purge System Supply Vv (MOV-HV-200A)	IC-1	2.6	-- DO --		--DO--		
			g. RHR Heat Exchanger Disch Vv (MOV-CC200A)	IC-1	1.3	-- DO --		--DO--		
			h. Incore Instr. Drive	IC-2						
			(1) Drive "C"		4	Breaker NZMB-9 30 300A		Breaker GE THED	20A	
			(2) Drive "D"		4	-- DO --		--DO--		
			(3) Drive "E"		4	-- DO --		--DO--		
21B	IC	10 AWG	a. RHR Pp Mtr Htr (2-RH-P-01B Mtr)	IC-8	-	Fuse Bussman KTK 1A		Breaker GE THED	20A	
			b. RC Air Recirc Fan Mtr Htr (2-HV-F-01B Htr)	IC-6	-	Fuse Bussman AGC 2.5A		Breaker GE THED	20A	
			c. Term Box Fan Incore Level Rm (JB-252-2)	IC-4	-	Breaker GE THQB 15A		Breaker GE THED	20A	

STONE & WEBSTER ENGINEERING CORPORATION
CALCULATION SHEET

Page No. SH-8

Client VEPCO — Location NA-2
Subject or Apparatus PENETRATION PROTECTION
By 1-7-80 — Checked 1-7-80

REV 1 ?PN 2-7-80 RLW 2-8-80

POSITION	PENETRATION TYPE	CONDUCTOR	LOAD	TIME-CURRENT CURVE 12050-3E	FULL LOAD AMPS	PRIMARY PROTECTION DEVICE	NOTES & COMMENTS	SECONDARY PROTECTIVE DEVICE		NOTES & COMMENTS
21E-2	IIA	8 AWG	d. Loop 1 Bypass Stop Vv (MOV-2585)	IG-1	1	Breaker HZM-6 30-250A with E2-19.5-NA OL htr & DIL 2V-22-NA Contactor	See Note 5 sh 4	Breaker GE THED	20A	
			e. Reactor Coolant Pp 1C Mtr Htr (2-RC-P-01C2 Mtr)	IG-1	3.25	-- DO --		--DO--		
			f. Reactor Coolant Pp 1A Mtr Htr (2-RC-P-01A2 Mtr)	IG-1	3.25	-- DO --		--DO--		
22A-2	IIA	8 AWG	a. Control Box for RC Vv T/C (2-EI-CB-161)	IIA-3	-	Breaker GE THQB 20A		Breaker GE THED	20A	
			b. JB for Fire Protection (JB-516-2)	IIA-3	-	Breaker GE THQB 20A		Breaker GE THED	20A	
			c. Containment Air Compressor (2-IA-C-0?B)	IIA-1	26	Breaker HZM-6 50-500A with E2-33-NA OL htr	See Note 1 sh 2	Breaker GE THED	35A	
			d. RHR Test Outlet Vv (MOV-2720B)	IIA-1	20	-- DO --		--DO--		
			e. Acc Tank Disch Vv (MOV-2865C)	IIA-1	8.1	-- DO --		--DO--		
22B-2	IIA	8 AWG	a. Loop 1 Hot Leg Stop Vv (MOV-2590)	IIA-2	26	-- DO --	See Note 1 sh 2	--DO--		
			b. Loop 1 Cold Leg Stop Vv (MOV-2591)	IIA-2	26	-- DO --		--DO--		
			c. RC Air Recirc Fan (2-HV-F-92B)	IIA-1	21	-- DO --		--DO--		
			d. RC Air Recirc Fan (2-HV-F-92C)	IIA-1	21	-- DO --		--DO--		
22C-2	IIC	2/0 AWG	a. Cont Rod Drive Mech. Fans (2-HV-F-37D)	IIC-2	92	Breaker HZM-9 130-2000A with Z4-130-NA OL htr	See Note 2 sh 2	Breaker GE THED	100A	
			b. Lighting Pnl 21-2	IIC-5	17kw	Breaker HZMS-9 160-2000A set @ 120	See Note 4 sh 3	Breaker GE THED	110A	SEE NOTE 4 SH 3
			c. Receptical	IIC-4	-	Breaker HZMH-9 60-800A		Breaker GE THED	100A	
22D-2	IIC	2/0 AWG	a. Cont Rod Drive Mech Fans (2-HV-F-37E)	IIC-2	92	Breaker HZM-9 130-2000A with Z4-130-NA OL htr	See Note 2 sh 2	Breaker GE THED	100A	
			b. Lighting Pnl 18-2	IIC-5	24.5kw	Breaker HZMS-9 160-2000A set @ 140	See Note 4 sh 3	Breaker GE THED	110A	SEE NOTE 4 SH 3
			c. Receptical	IIC-4	-	Breaker HZMH-9 60-800A		Breaker GE THED	100A	

STONE & WEBSTER ENGINEERING CORPORATION
CALCULATION SHEET

Page No. 3H 7

Client: VEPCO   Location: NA-2   J.O. No. 12050
Subject or Application: PENETRATION PROTECTION
Date: 1-7-80   Checked: 1-2-80

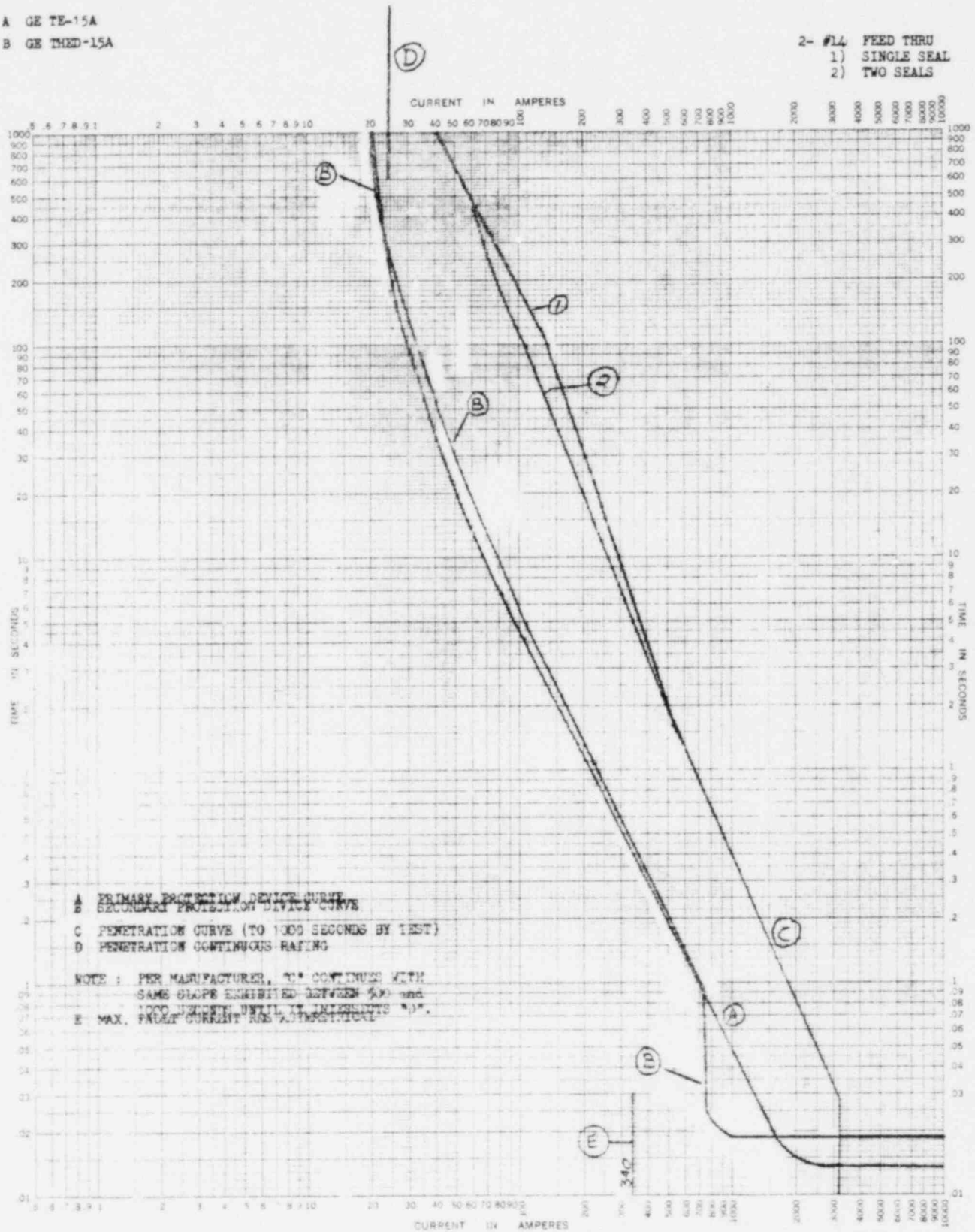
REV 1 NN 2-7-80
RLW 2-8-80

PENETRATION NO.	PENETRATION TYPE	CONDUCTOR	LOAD	TIME CURRENT CURVE FIGURE NO.	FULL LOAD AMPS	PRIMARY PROTECTIVE DEVICE	NOTES & COMMENTS	SECONDARY PROTECTIVE DEVICE	NOTES & COMMENTS
2[illegible]-2	110	2/0 AWG	a. RC Air Recirc Fans (2-HV-F-1B)	110-1	250	Breaker with OD-6, 300A coil LTD-100% Min. (or Inter.) Inst. 1200%		Breaker with OD-6, 300A coil LTD-100% (or Inter.) Inst. 1200%	
			b. Cool Rod Drive Mech Fans (2-HV-F-37B)	110-2	52	Breaker NZM-9 130-2000A with [illegible]	See Note 2 sh 2	Breaker GE THQD 100A	
			c. Lighting Pnl 32-2	110-3	13.5kw	Breaker NZMH-4 140-3000A set [illegible]	See Note 4 sh 3	Breaker GE THQD 110A	SEE NOTE 4 SH 3
[illegible]-2	110	250 MCM	a. Lighting Pnl 16-2	110-[illegible]	75kw	Breaker NZMH-4 200-3000A set [illegible]	See Note 4 sh 3	Breaker GE THFK 175A	SEE NOTE 4 SH 3
			b. RC Polar Crane (2-HD-CR-1)	N/A	200	Breaker Normally Open		N/A	
[illegible]-2	110	250 MCM 2 C Per Phase	Reactor Spray Pp (Inside) (2-[illegible]-P-1B)	110-[illegible]	338	Breaker with OD-6 [illegible] coil LTD-100% Min, Inst 1200%		Breaker with OD-6 [illegible] coil LTD-100% Min, Inst 1200%	
2[illegible]-1 2[illegible]-2	VL VL	1000 MCM 2 C Per Phase	Reactor Coolant Pp (2-RC-P-1B)	VA-1	115/85%	Relay 12IAC 66 B 3A	Controls Breaker Position 25 & 3	Relay IAC[illegible]	Controls Breaker Position 25A2 or 25A.
2[illegible]-2	VB	1000 MCM	Residual Heat Removal Pp (2-RH-P-1B)	VB-1	40	Relay 12IAC 66 B 3A	Controls Breaker Position 25 & 14	Relay IAC53A	Controls Breaker Position 25B12

A GE TE-15A

B GE THED-15A

2- #14 FEED THRU
1) SINGLE SEAL
2) TWO SEALS



A PRIMARY PROTECTION DEVICE CURVE
B SECONDARY PROTECTION DEVICE CURVE
C PENETRATION CURVE (TO 1000 SECONDS BY TEST)
D PENETRATION CONTINUOUS RATING

NOTE : PER MANUFACTURER, "D" CONTINUES WITH SAME SLOPE EXHIBITED BETWEEN "C" and 1000 AMPERES UNTIL IT INTERSECTS "D".

E MAX. FAULT CURRENT AND ASYMMETRICAL

TIME-CURRENT CHARACTERISTIC CURVES

For ____ Fuse Links, ____ In ____

BASIS FOR DATA Standards ____ Dated ____

1. Tests made at ____ Volts a-c at ____ p.f., starting at 25C with no initial load ____

2. Curves are plotted to ____ Test points so variations should be ____

No. 12050-SK-IB-1

Date 1-7-80 RLW
1-7-80 RLW

REV 1 RLW 2-7-80
RLW 2-8-80

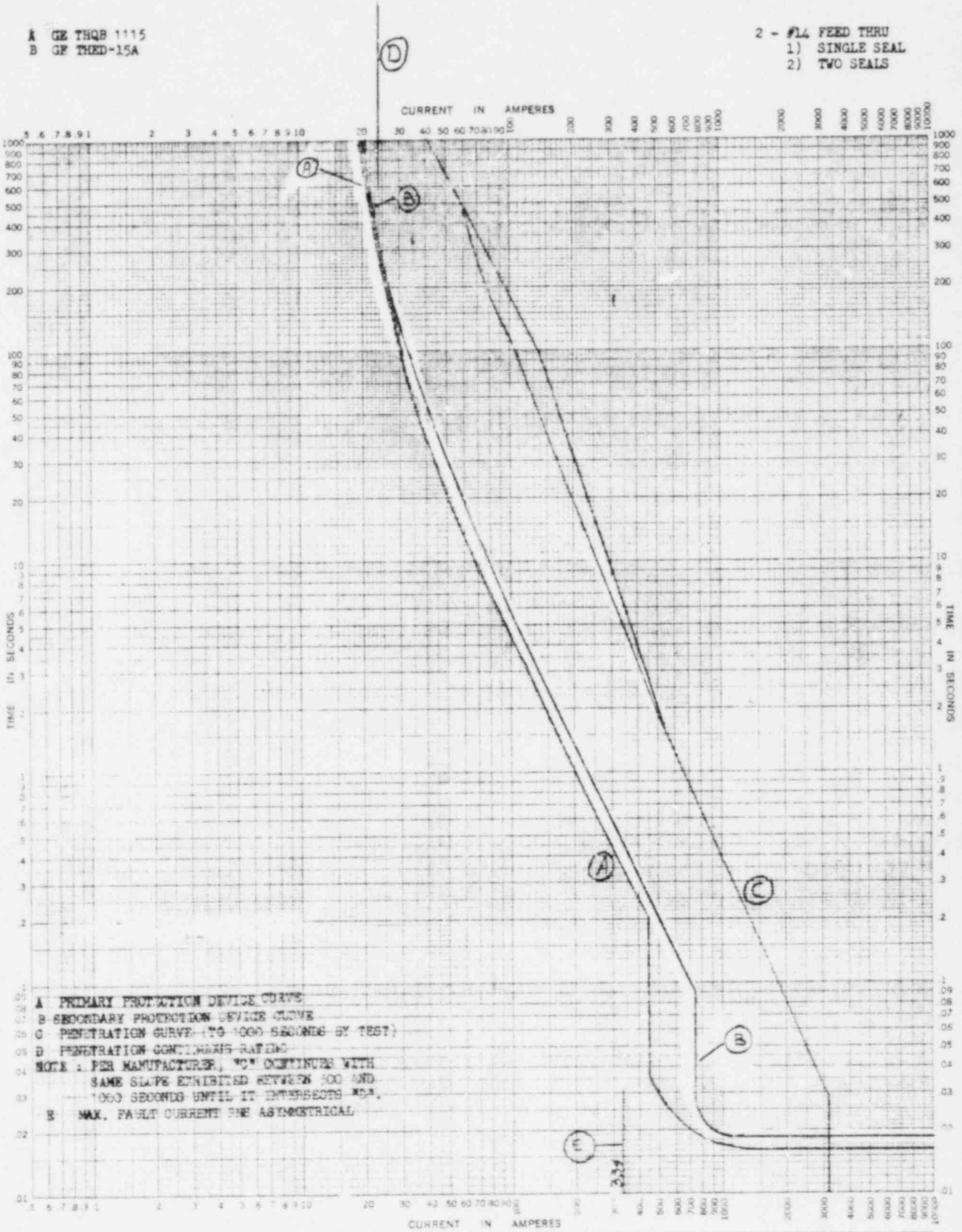
K-E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. MADE IN U.S.A. 48 5258

PENETRATION TYPE IB

WHITTAKER REF JUNC. BOX (JB-676-2)

A GE THQB 1115
B GE THED-15A

2 - #14 FEED THRU
1) SINGLE SEAL
2) TWO SEALS



A PRIMARY PROTECTION DEVICE CURVE
B SECONDARY PROTECTION DEVICE CURVE
C PENETRATION CURVE (TO 1000 SECONDS BY TEST)
D PENETRATION CONTINUOUS RATING
NOTE 1. PER MANUFACTURER, "C" CONTINUES WITH SAME SLOPE EXHIBITED BETWEEN 500 AND 1000 SECONDS UNTIL IT INTERSECTS "D".
E MAX. FAULT CURRENT PRE ASYMMETRICAL

TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links. In _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p.f. starting at 25C with no initial load _____

2. Curves are plotted to _____ Test points so variations should be _____

No. 12050-SK-IS-2
Date 1-7-80 RLW
1-7-80

REV 1 RLW 2-8-80

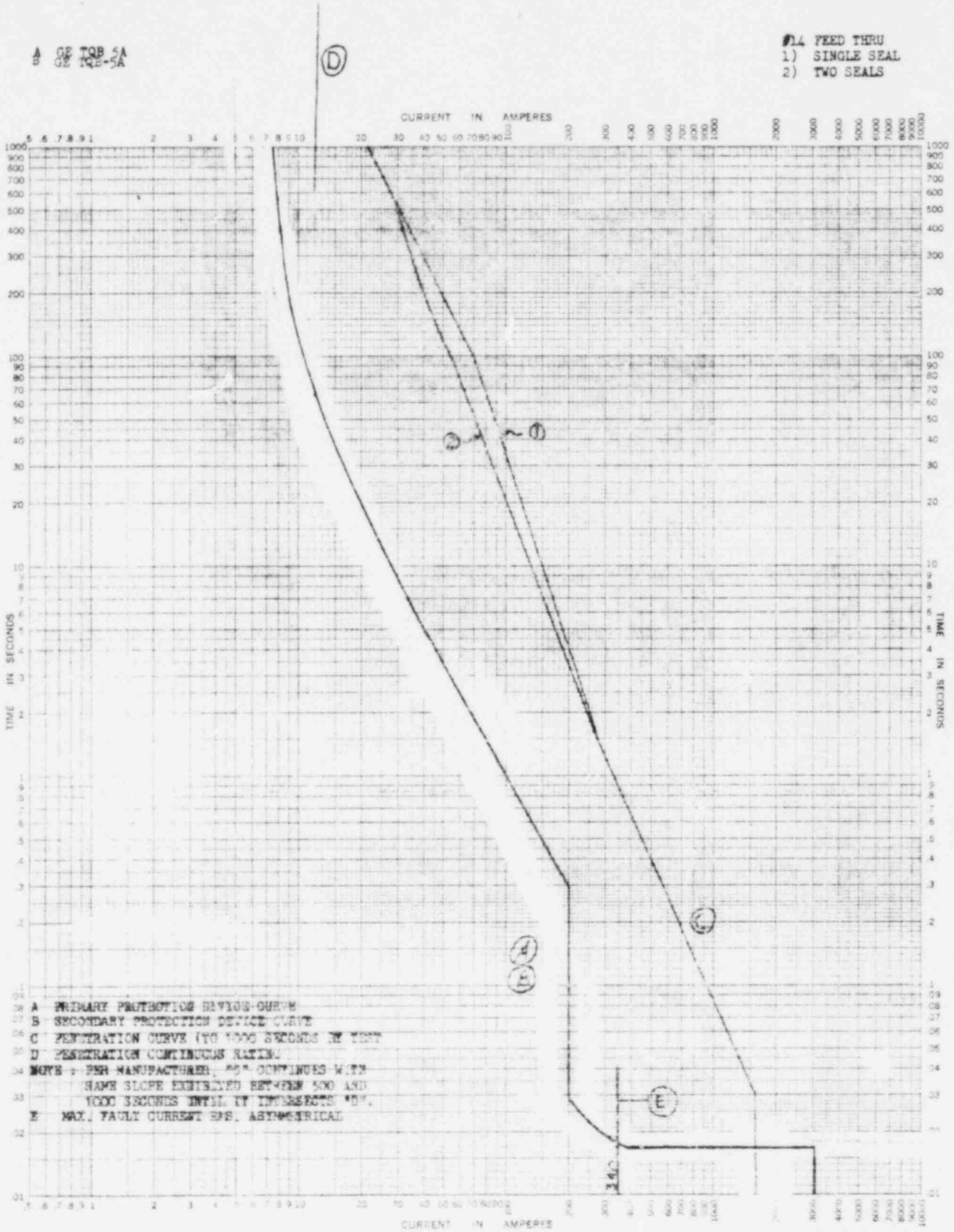
K-E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. 48 5258

PENETRATION TYPE IB

PS-DG 201/SOV-DG201 (JB-190-2)

A GE TQB 5A
B GE TQE-5A

#14 FEED THRU
1) SINGLE SEAL
2) TWO SEALS



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links. In _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p.f. starting at 25C with no initial load

2. Curves are plotted to _____ Test points so variations should be _____

No. 12050-8R-1B-1

Date 1-7-80 [illegible]
1-7-80 [illegible]

REV 1 [illegible] 2-7-80
[illegible] 2-8-80

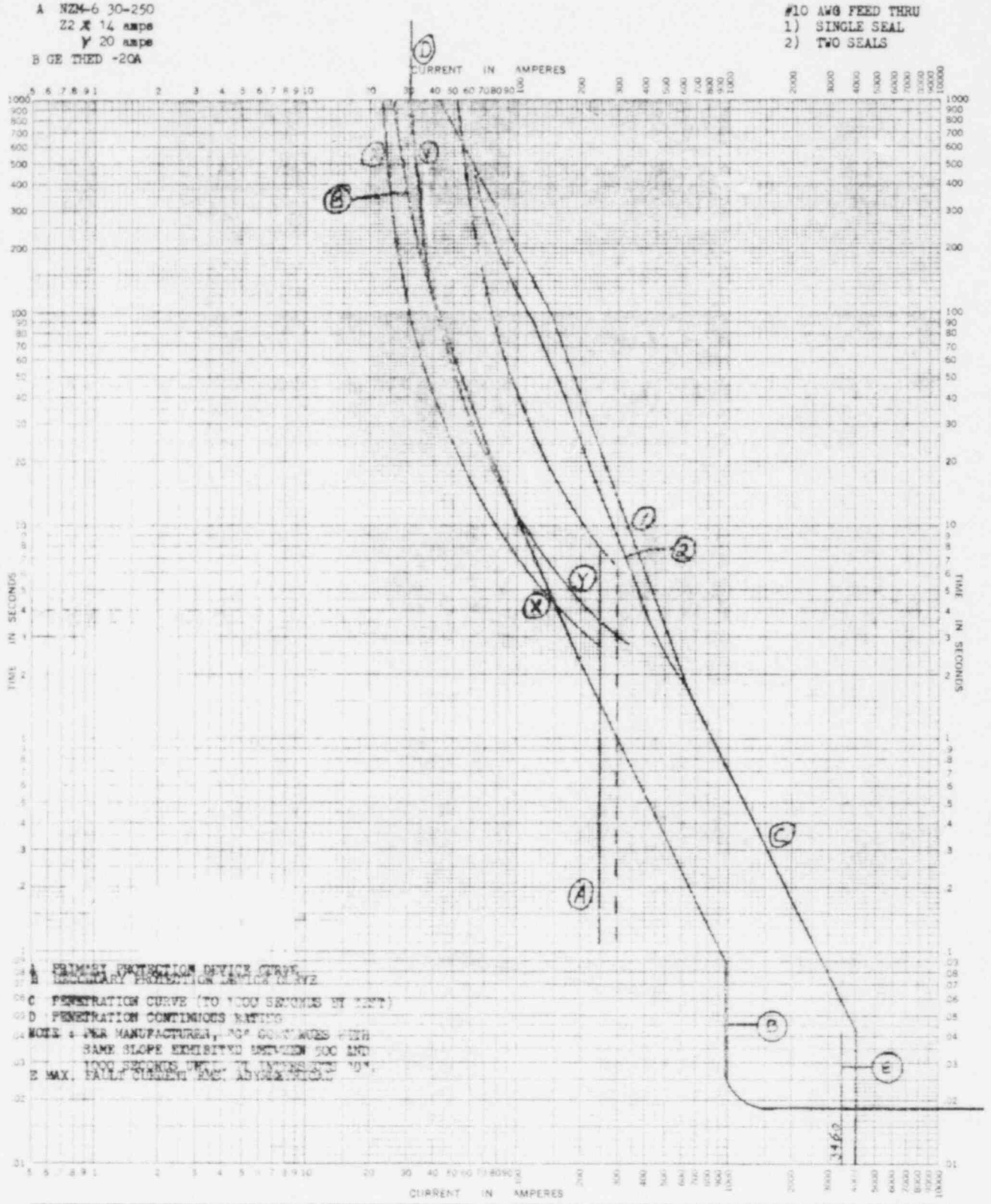
K-E TIME-CURRENT CHARACTERISTIC 48 5258
KEUFFEL & ESSER CO. [illegible]

PENETRATION TYPE IB

LT-2470
MG-LM200

A NZM-6 30-250
Z2 X 14 amps
Y 20 amps
B GE THED -20A

#10 AWG FEED THRU
1) SINGLE SEAL
2) TWO SEALS



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links, In _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c or _____ p.f., starting at 25C with no initial load.
2. Curves are plotted to _____ Test points so variations should be _____

No. 12050-CK-IC-1
Date 1-7-80 AN
1-2-82

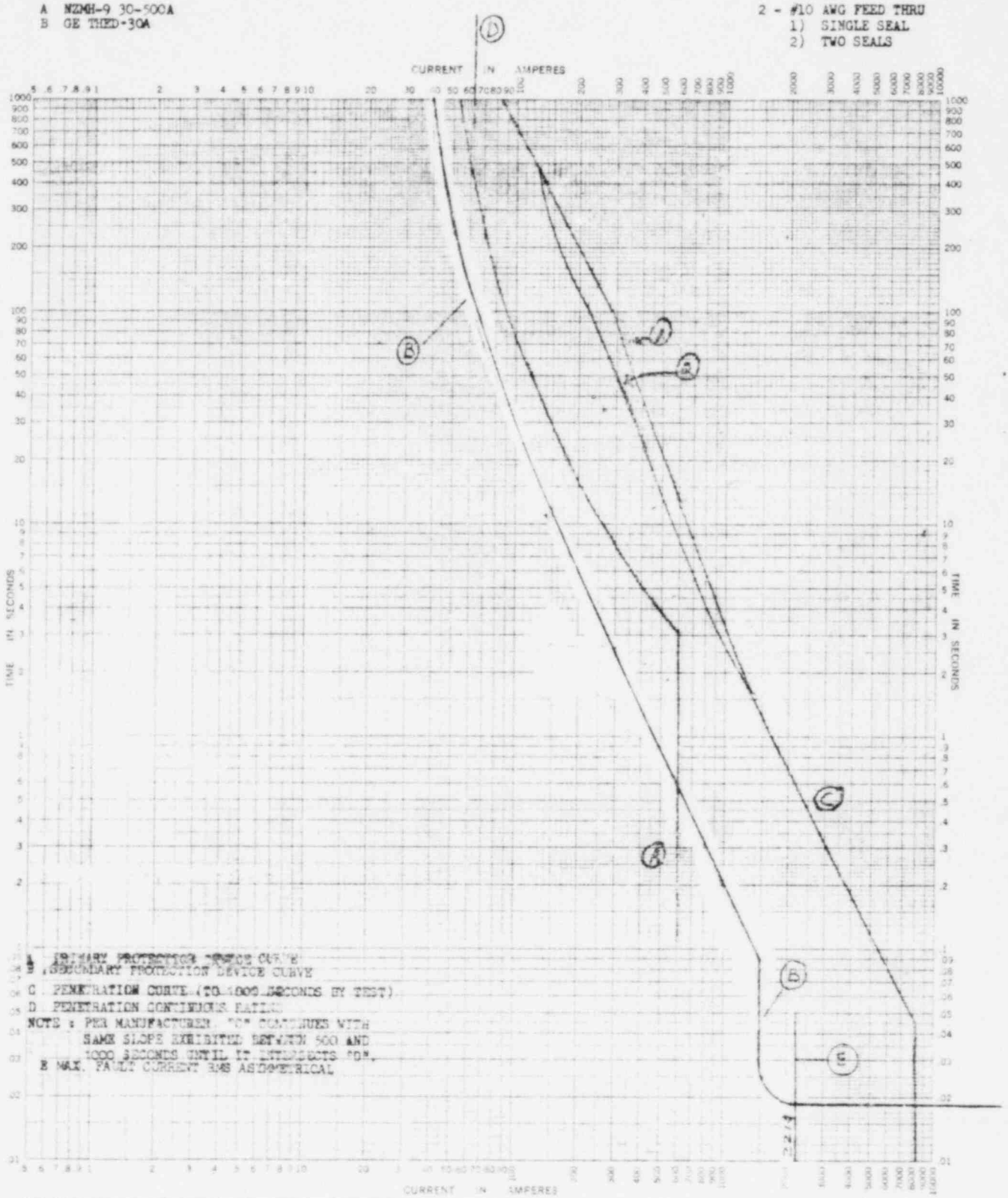
Rev 1 JAW 2-7-80
RLW 2-8-80

K-E TIME-CURRENT CHARACTERISTIC AR 5258
KEUFFEL & ESSER CO. NEW YORK

PENETRATION TYPE IC

A NZMH-9 30-500A
B GE THED-30A

2 - #10 AWG FEED THRU
1) SINGLE SEAL
2) TWO SEALS



A PRIMARY PROTECTION DEVICE CURVE
B SECONDARY PROTECTION DEVICE CURVE
C PENETRATION CURVE (TO 1000 SECONDS BY TEST)
D PENETRATION CONTINUOUS RATING
NOTE : PER MANUFACTURER "D" CONTINUES WITH SAME SLOPE EXHIBITED BETWEEN 500 AND 1000 SECONDS UNTIL IT INTERSECTS "C", E MAX. FAULT CURRENT WAS ASYMMETRICAL

TIME-CURRENT CHARACTERISTIC CURVES

For ... Fuse Links In ...

BASIS FOR DATA Standards ... Dated ...

1. Tests made at ... Volts a-c at ... p.f. starting at 25C with no initial load
2. Curves are plotted to ... Test points so variations should be ...

No. 12050-8K-10-2
Date 1-7-80 1-2-80

REV 1 RHW 2-7-80
RLW 2-8-80

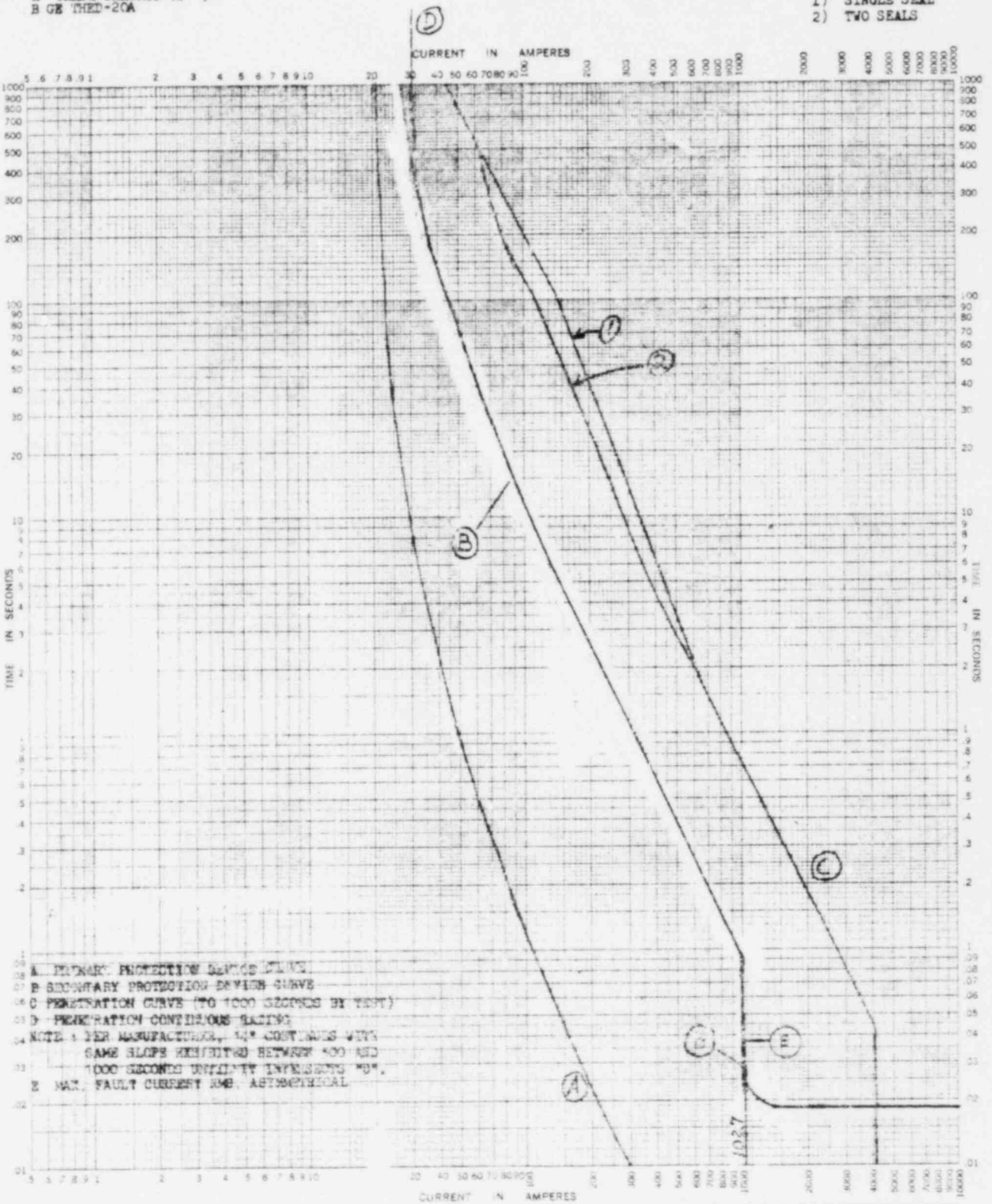
K-E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. MADE IN U.S.A. 48 5253

PENETRATION TYPE IC

INCORE DRIVE ASSEMBLIES
(A THRU E)

A CHASE SHAWMUT CT 15
B GE THED-20A

#10 AWG FEED THRU
1) SINGLE SEAL
2) TWO SEALS



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p.f. starting at 25C with no initial load.
2. Curves are plotted to _____ Test points so variations should be _____

No. 12050-SK-IC-3

Date 1-7-80 REV 1 RPH 2-7-80 RLW 2-8-80

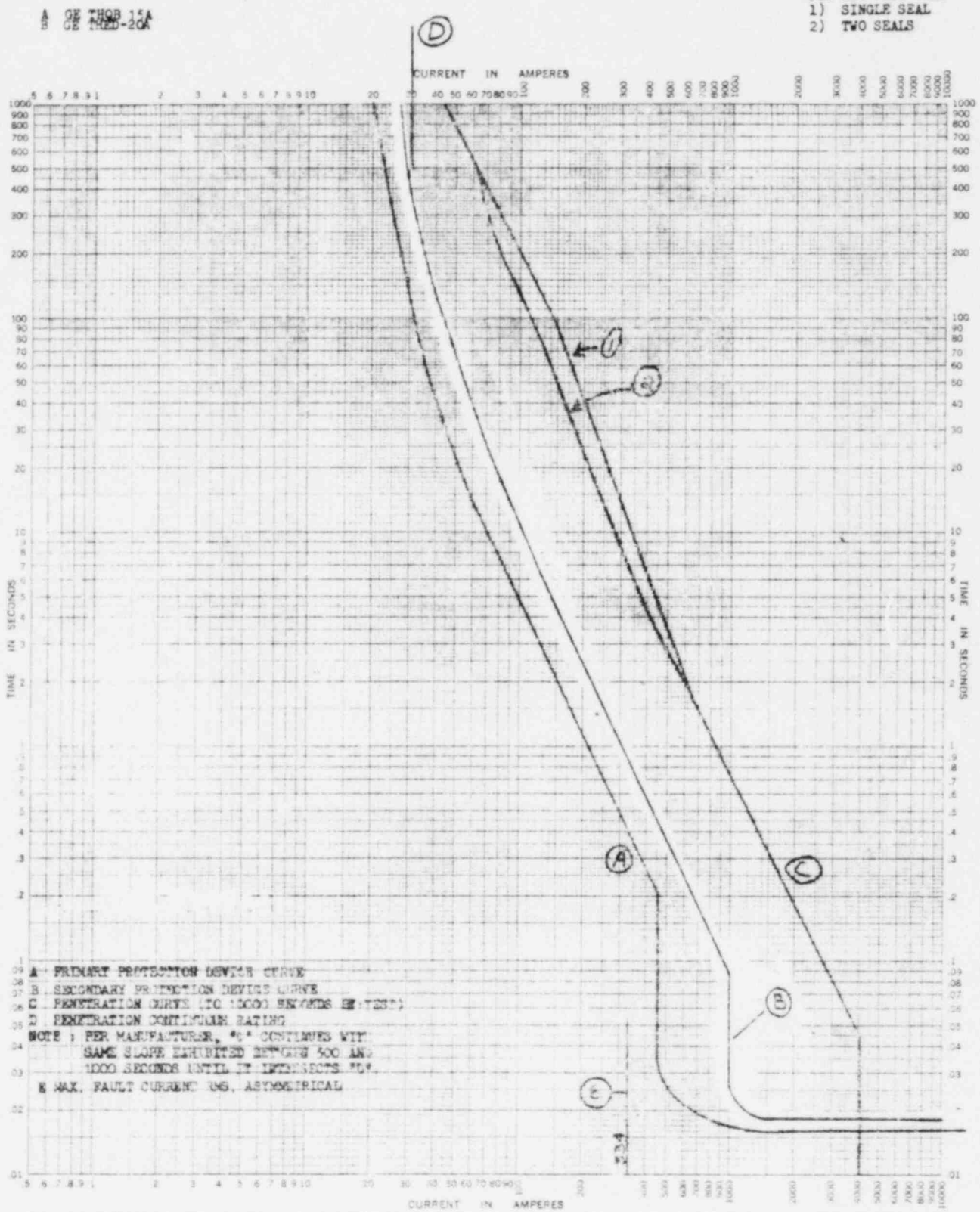
K-E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. 46 5255

PENETRATION TYPE IC

FLUX MAPPING - DEHUMIDIFIERS

A GE THQB 15A
B GE THED-20A

#10 AWG FEED THRU
1) SINGLE SEAL
2) TWO SEALS



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links In _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p.f., starting at 25C with no initial load _____

2. Curves are plotted to _____ Test points so variations should be _____

No. 12060-SK-IC-4

Date 1-7-80 RPV
1-7-80 TW-3

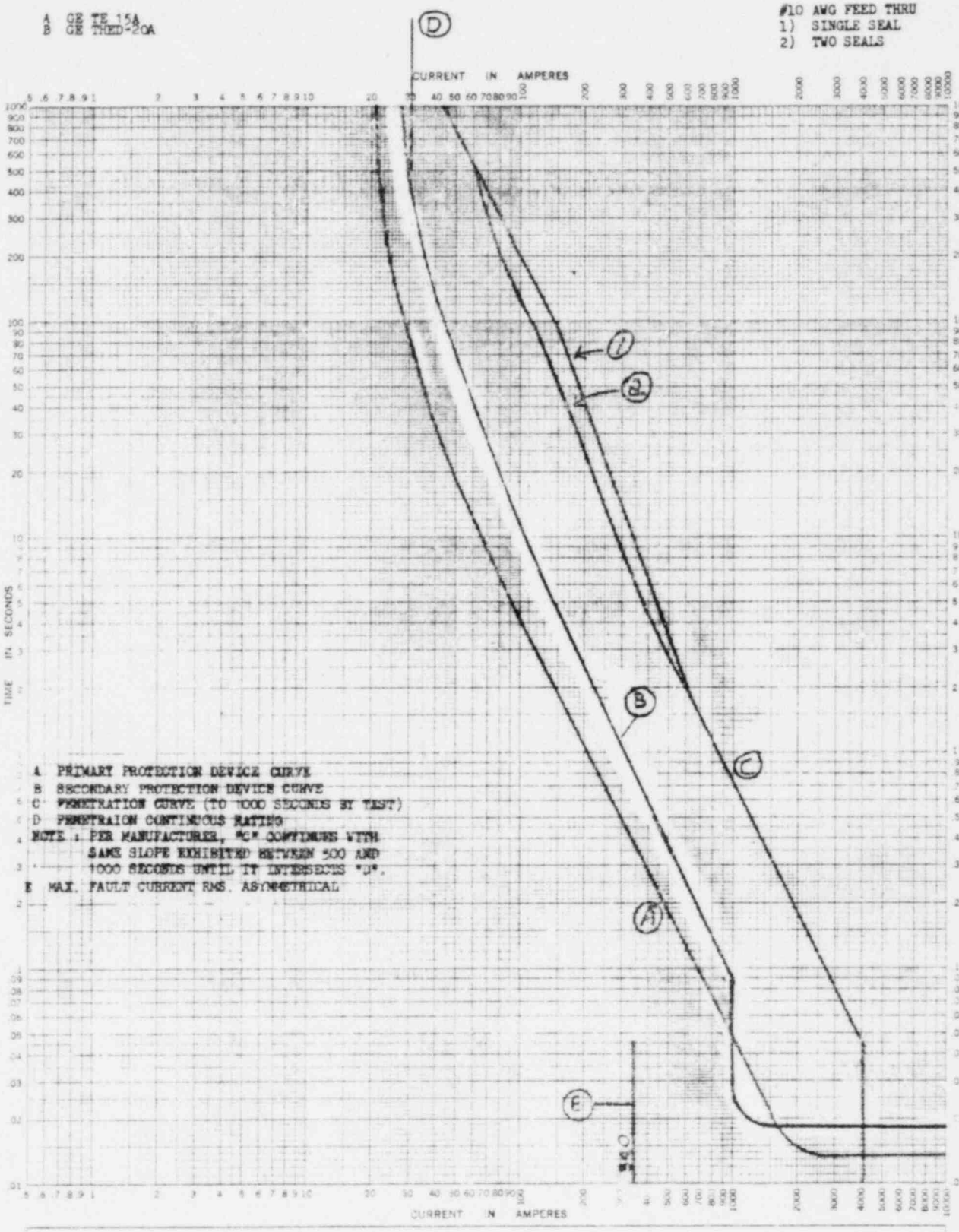
REV 1 JAN 2-7-80
RLW 2-8-80

K•E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. 48 5238

PENETRATION TYPE IC

A GE TE 15A
B GE THED-2OA

#10 AWG FEED THRU
1) SINGLE SEAL
2) TWO SEALS



A PRIMARY PROTECTION DEVICE CURVE
B SECONDARY PROTECTION DEVICE CURVE
C PENETRATION CURVE (TO 1000 SECONDS BY TEST)
D PENETRAION CONTINUOUS RATING
NOTE 1. PER MANUFACTURER, "C" CONTINUES WITH SAME SLOPE EXHIBITED BETWEEN 500 AND 1000 SECONDS UNTIL IT INTERSECTS "B".
E MAX. FAULT CURRENT RMS. ASYMMETRICAL

TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links. IA _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p-f., starting at 25C with no initial load _____

2. Curves are plotted to _____ Test points so variations should be _____

No. 12050-SK-IC-5
Date 1-7-80 JAW
1-2-80 RLW

REV 1 JAW 2-7-80
RLW 2-8-80

K-E TIME-CURRENT CHARACTERISTIC 48 5258
KEUFFEL & ESSER CO. HOBOKEN

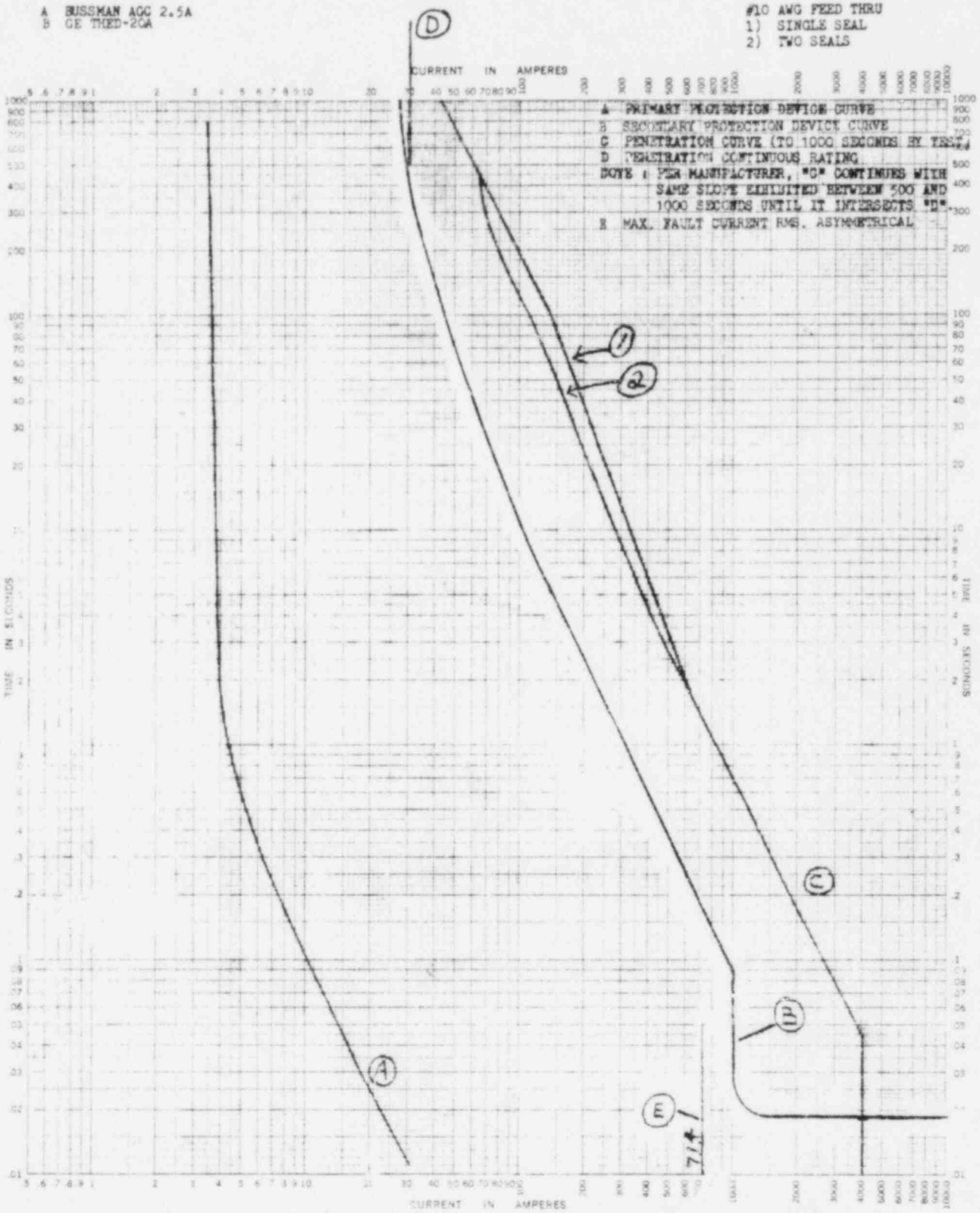
PENETRATION TYPE IC

2-IA-D-02A-B

WHITEMAN IND. JESCO BOX (JB-6752)

A BUSSMAN AGC 2.5A
B GE THED-2QA

#10 AWG FEED THRU
1) SINGLE SEAL
2) TWO SEALS



TIME-CURRENT CHARACTERISTIC CURVES

For ____ Fuse Links, in ____

BASIS FOR DATA Standards ____ Dated ____

1. Tests made at ____ Volts a-c at ____ p-f., starting at 25C with no initial load
2. Curves are plotted to ____ Test points so variations should be ____

No. 12050-SK-IC-6
Date 1-7-80 JPN
1-7-80 JHC

REV 1 JPN 2-7-80
RLW 2-8-80

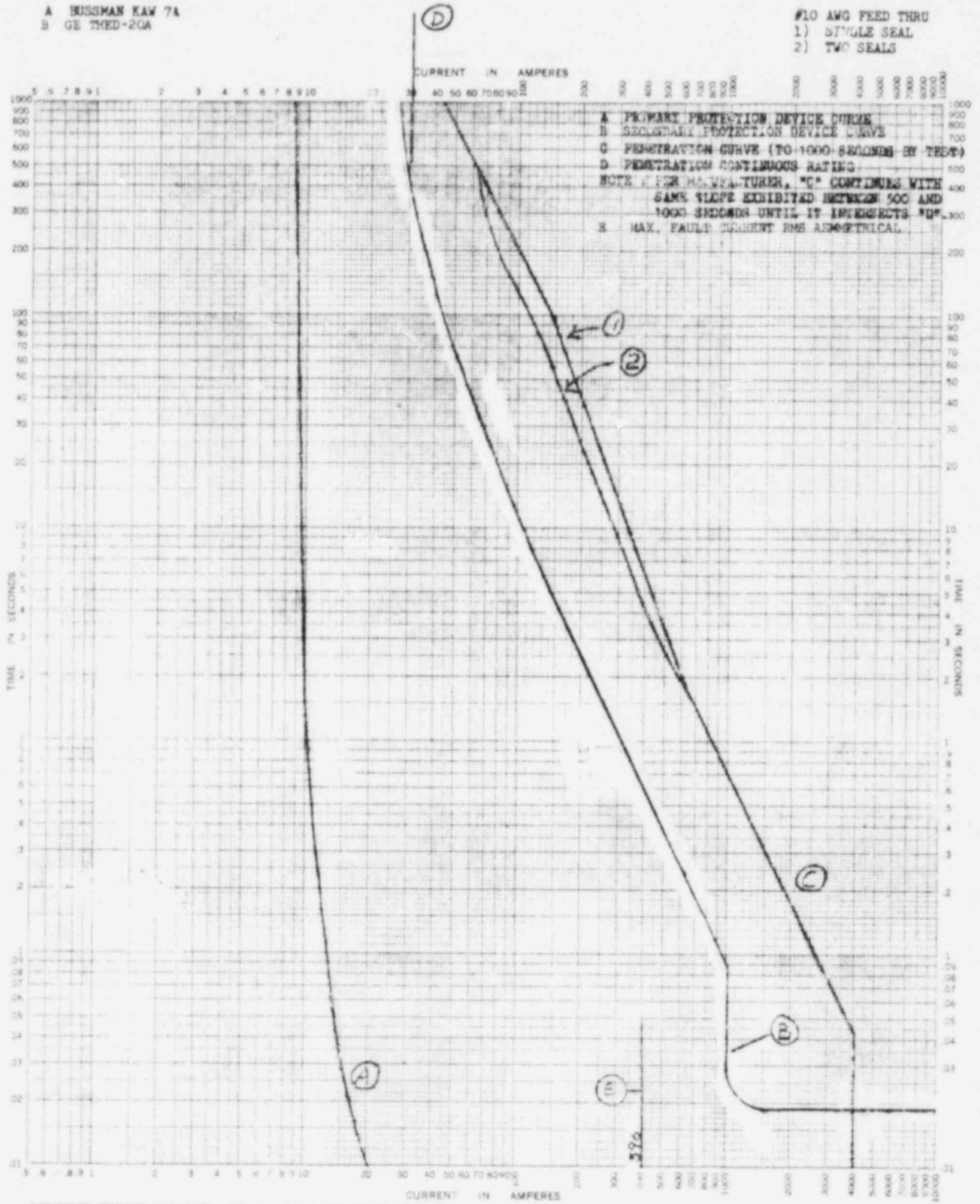
K-E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. MADE IN U.S.A. 48 5258

PENETRATION TYPE IC

CONT. RECIRC. FAN MOTOR HTRS.

A BUSSMAN KAW 7A
B GE TMED-2GA

#10 AWG FEED THRU
1) SINGLE SEAL
2) TWO SEALS



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links: In _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p.f., starting at 25C with no initial load

2. Curves are plotted to _____ Test points so variations should be _____

No. LR050-SK-IC-7
Date 1-7-80 JPH
1-7-80 RLW

REV 1 JPH 2-7-80
RLW 2-8-80

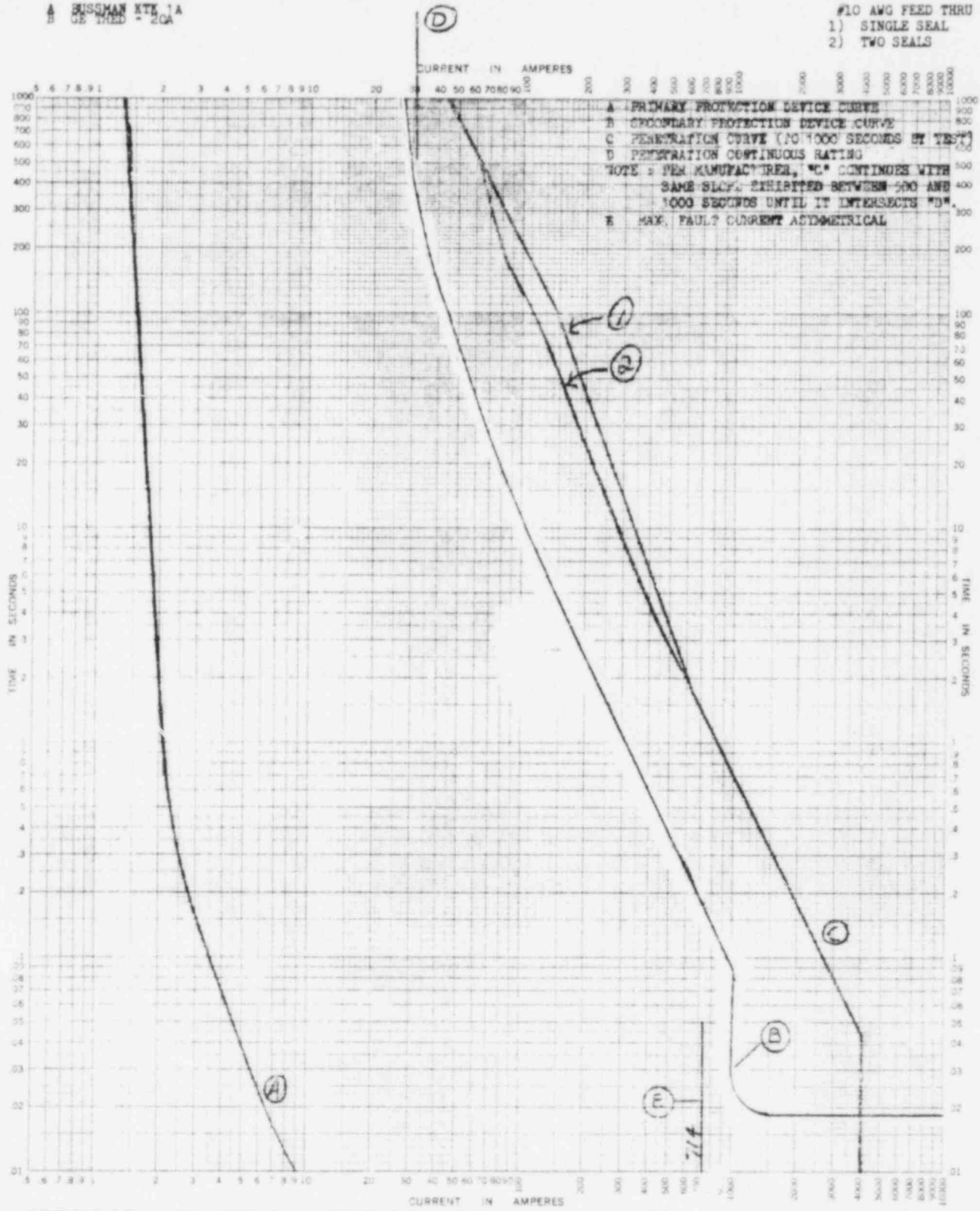
K&E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. MADE IN U.S.A. 48 5255

PENETRATION TYPE IC

PART LENGTH RODS

A BUSSMAN KTK 1A
B GE THED - 20A

#10 AWG FEED THRU
1) SINGLE SEAL
2) TWO SEALS



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links, In _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p-f., starting at 25C with no initial load
2. Curves are plotted to _____ Test points so variations should be

No. 12050-3X-10-8

Date 1-2-80

REV 1 PAN 2-7-80
RLW 2-8-80

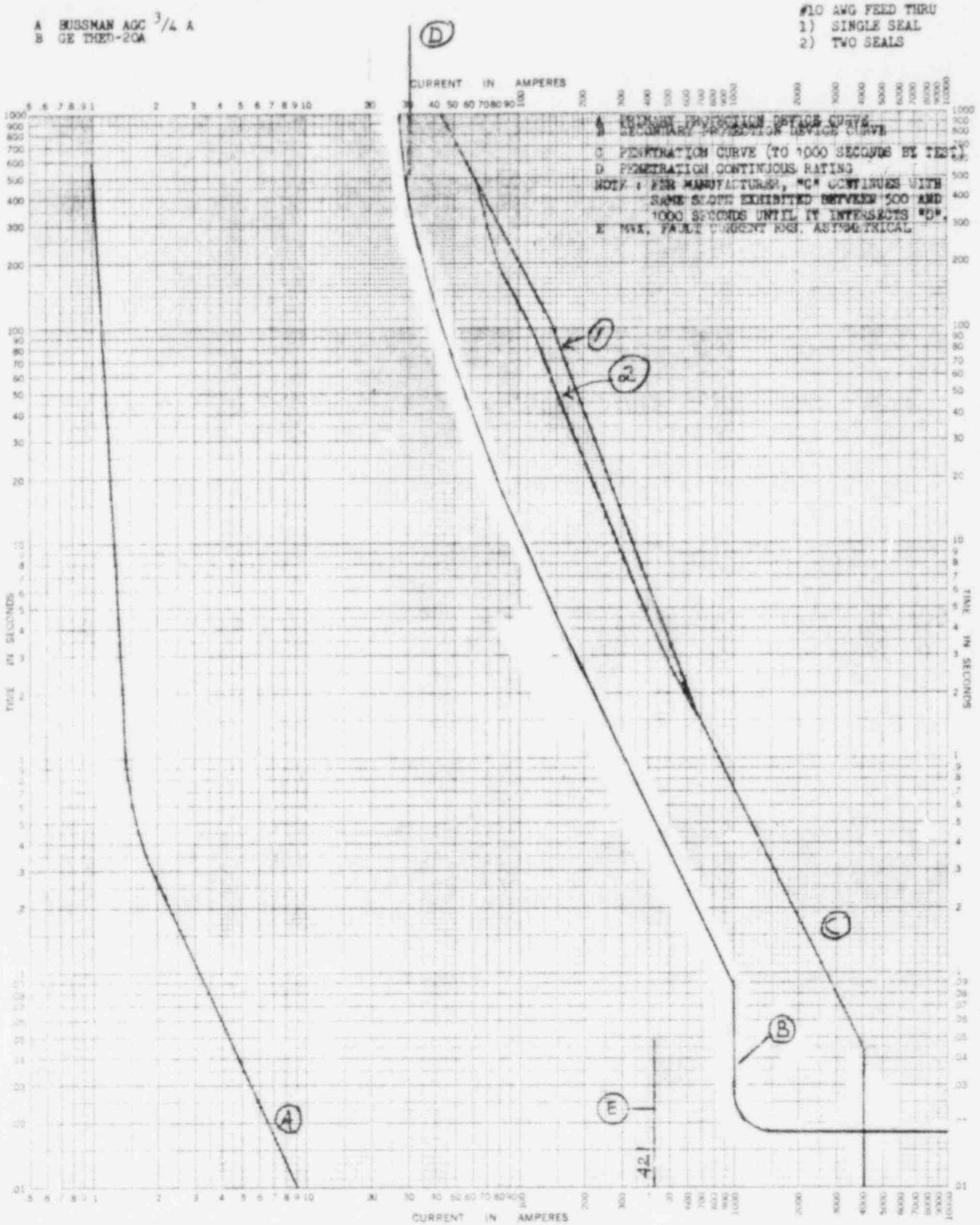
K-E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. 46 5258

PENETRATION TYPE IC

RHR PUMP MOTOR HTR.
RS PUMP MOTOR HTR.

A HUSSMAN AGC 3/4 A
B GE THED-20A

#10 AWG FEED THRU
1) SINGLE SEAL
2) TWO SEALS



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links, In _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts and at _____ p.f., starting at 25C with no initial load

2. Curves are plotted to _____ Test points so variations should be _____

No. 12050-SK-IC-9

Date 1-7-80 JJH
1-7-80 RLW

K-E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. MADE IN U.S.A. 46 5258

REV1 JJH 2-7-80
RLW 2-8-80

PENETRATION TYPE IC

FLUX MAPPING - CONTROL POWER

A BUSSMAN AGC 6A
B GE TNED -20A

#10 AWG FEED THRU
1) SINGLE SEAL
2) TWO SEALS

A PRIMARY PROTECTION DEVICE CURVE
B SECONDARY PROTECTION DEVICE CURVE
C PENETRATION CURVE (TO 1000 SECONDS BY TEST)
D PENETRATION CONTINUOUS RATING
NOTE: PER MANUFACTURER, "C" CONTINUES WITH SAME SLOPE EXHIBITED BETWEEN 300 AND 1000 SECONDS UNTIL IT INTERSECTS "D".
E MAX. FAULT CURRENT RMS. ASYMMETRICAL

CURRENT IN AMPERES

TIME IN SECONDS

CURRENT IN AMPERES

TIME IN SECONDS

456

TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links In _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p.f., starting at 25C with no initial load _____
2. Curves are plotted to _____ Test points so variations should be _____

No. 12050-SK-1C-10
Date 1-7-80 RJW
1-7-80 RJW-3

REV 1 RJW 2-7-80
RLW 2-8-80

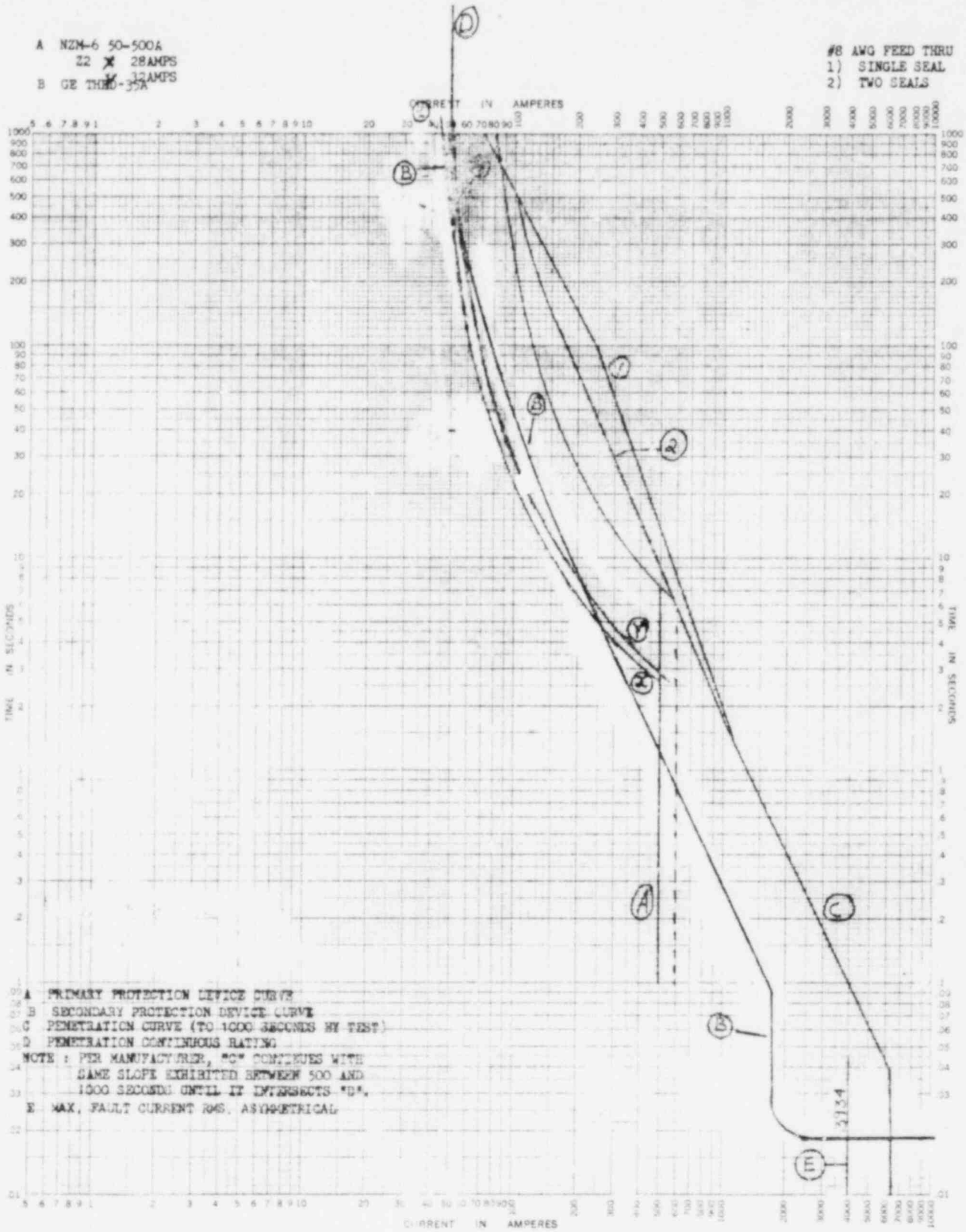
K-E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. AB 5256

PENETRATION TYPE IC

ELEVATOR - CONTROL & BREAK

A NZM-6 50-500A
Z2 X 28AMPS
B GE THED-35A

#8 AWG FEED THRU
1) SINGLE SEAL
2) TWO SEALS



A PRIMARY PROTECTION DEVICE CURVE
B SECONDARY PROTECTION DEVICE CURVE
C PENETRATION CURVE (TO 1000 SECONDS BY TEST)
D PENETRATION CONTINUOUS RATING
NOTE : PER MANUFACTURER, "C" CONTINUES WITH SAME SLOPE EXHIBITED BETWEEN 500 AND 1000 SECONDS UNTIL IT INTERSECTS "D".
E MAX. FAULT CURRENT RMS. ASYMMETRICAL

TIME-CURRENT CHARACTERISTIC CURVES

For

Fuse Links: In

BASIS FOR DATA Standards Dated

1. Tests made at Volts a-c at p.f. starting at 25C with no initial load

2. Curves are plotted to Test points so variation, should be

No. 12050-SK-IIA-1

Date 1-7-80 JAH
1-2-ITE, RWG

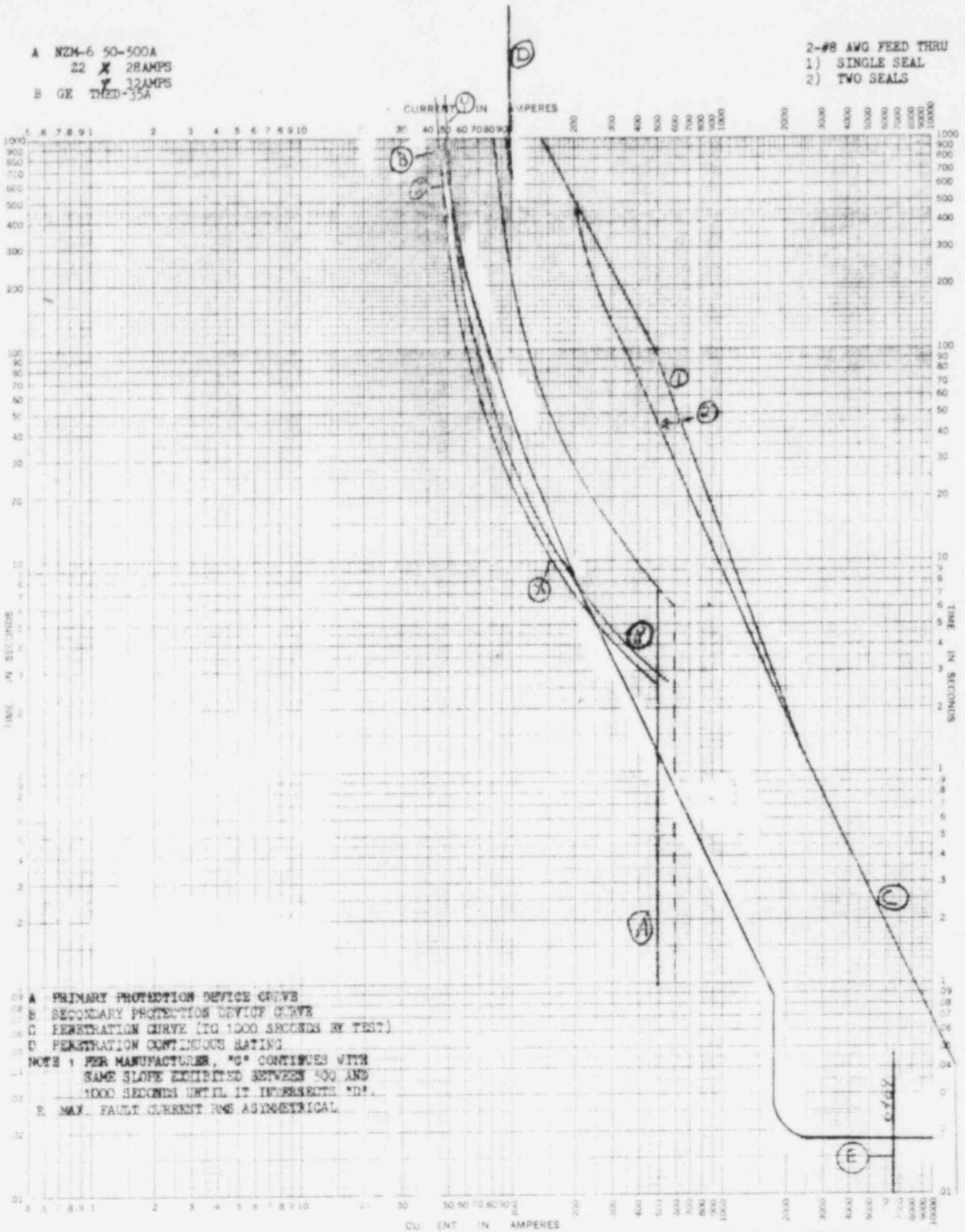
REV 1 JAH 2-7-80
RLW 2-8-80

K-E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. 48 5258

PENETRATION TYPE IIA

A NZM-6 50-500A
Z2 X 28AMPS
Y 32AMPS
B GE THED-35A

2-#8 AWG FEED THRU
1) SINGLE SEAL
2) TWO SEALS



A PRIMARY PROTECTION DEVICE CURVE
B SECONDARY PROTECTION DEVICE CURVE
C PENETRATION CURVE (TO 1000 SECONDS BY TEST)
D PENETRATION CONTINUOUS RATING
NOTE 1 PER MANUFACTURER, "C" CONTINUES WITH SAME SLOPE EXHIBITED BETWEEN 500 AND 1000 SECONDS UNTIL IT INTERSECTS "D".
E MAX. FAULT CURRENT RMS ASYMMETRICAL

TIME-CURRENT CHARACTERISTIC CURVES

For ____ Fuse Links ____

BASIS FOR DATA Standards ____ Dated ____

1. Tests made at ____ Volts a-c at ____ p.f., starting at 25C with no initial load.
2. Curves are plotted to ____ Test points so variations should be ____

No. 12050-3K-IIA-2
Date 1-7-80 JPN
1-8-80 RLW

REV. 1 JPN 2-7-80
RLW 2-8-80

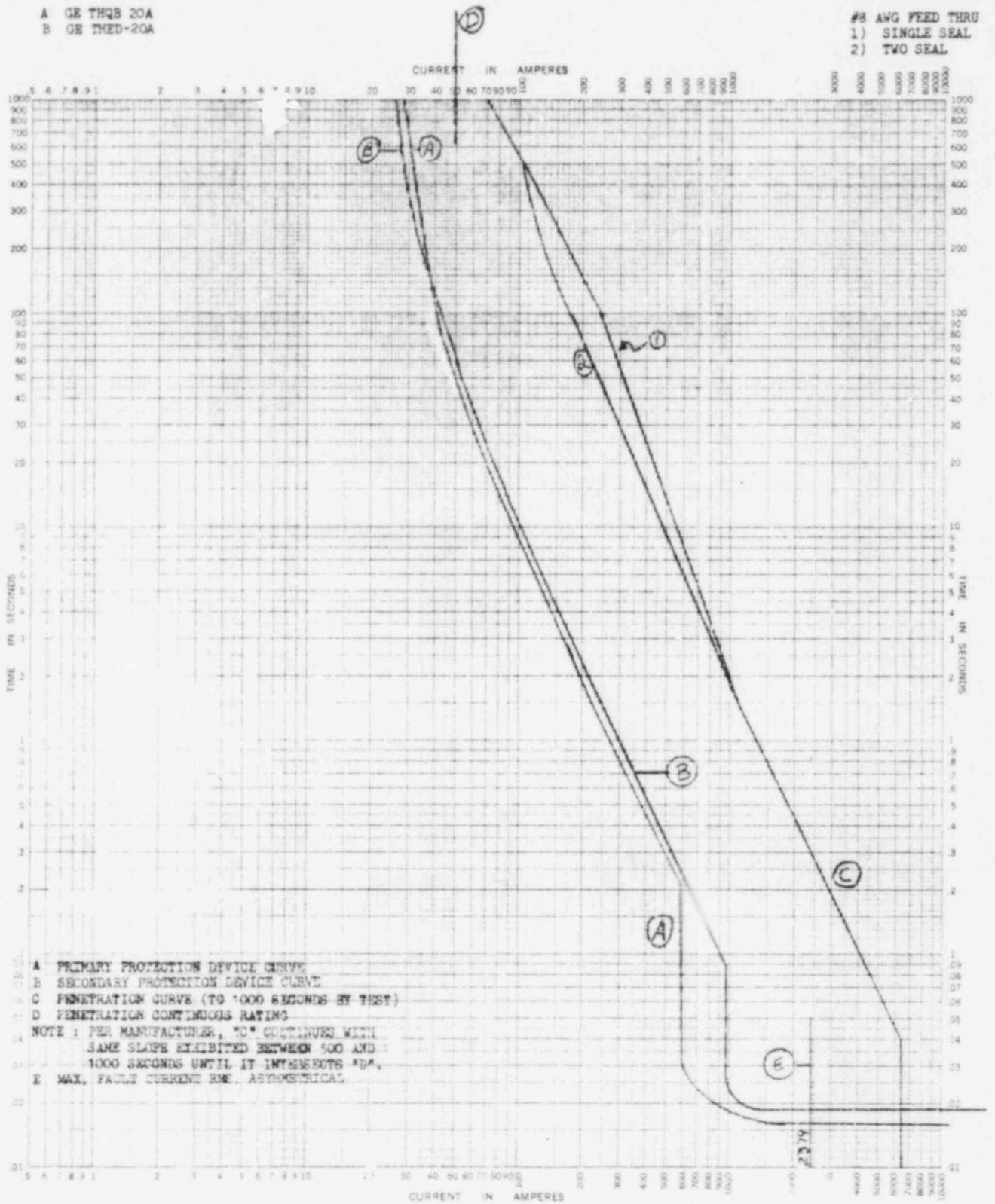
K-E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. MADE IN U.S.A. 46 5258

PENETRATION TYPE IIA

MOV-2590 THRU 95

A GE THQB 20A
B GE THED-20A

#8 AWG FEED THRU
1) SINGLE SEAL
2) TWO SEAL



A PRIMARY PROTECTION DEVICE CURVE
B SECONDARY PROTECTION DEVICE CURVE
C PENETRATION CURVE (TO 1000 SECONDS BY TEST)
D PENETRATION CONTINUOUS RATING
NOTE : PER MANUFACTURER, "C" CONTINUES WITH SAME SLOPE EXHIBITED BETWEEN 500 AND 1000 SECONDS UNTIL IT INTERSECTS "B".
E MAX. FAULT CURRENT RMS. ASYMMETRICAL

TIME-CURRENT CHARACTERISTIC CURVES

For ____ Fuse Links. Tn ____

BASIS FOR DATA Standards ____ Dated ____

1. Tests made at ____ Volts a-c at ____ p.f., starting at 25C with no initial load

2. Curves are plotted to ____ Test points so variations should be ____

No. 12050-SX-IIA-3
Date 1-7-80 MPH
1-7-80 RLW

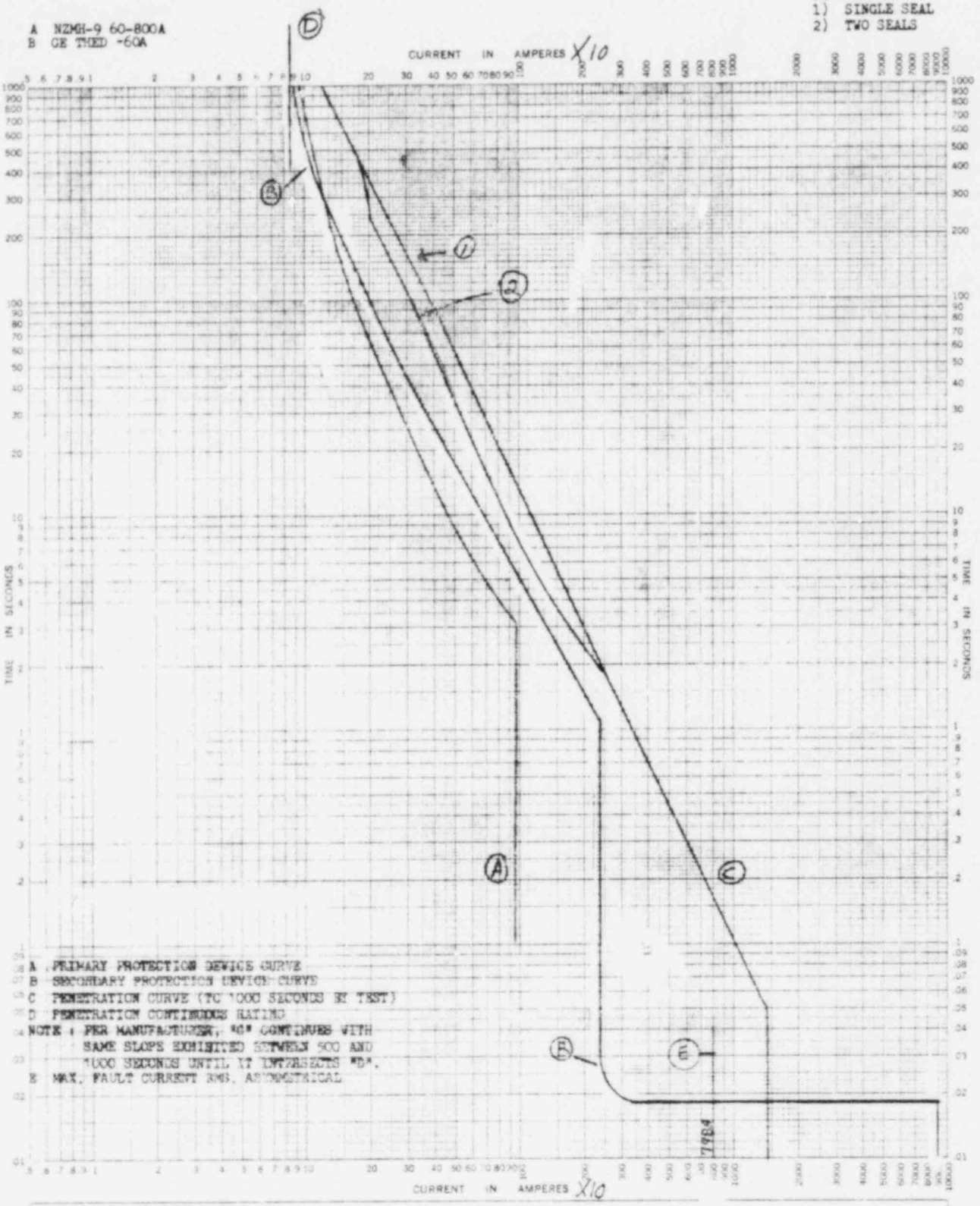
REV 1 MPH 2-7-80
RLW 2-8-80

K-E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. 48 5253

PENETRATION TYPE IIA

#4 AWG F.T.
1) SINGLE SEAL
2) TWO SEALS

A NZMH-9 60-800A
B GE THED -60A



A PRIMARY PROTECTION DEVICE CURVE
B SECONDARY PROTECTION DEVICE CURVE
C PENETRATION CURVE (TO 1000 SECONDS BY TEST)
D PENETRATION CONTINUOUS RATING
NOTE : PER MANUFACTURER, "C" CONTINUES WITH SAME SLOPE EXHIBITED BETWEEN 500 AND 1000 SECONDS UNTIL IT INTERSECTS "D".
E MAX. FAULT CURRENT RMS. ASYMMETRICAL

TIME-CURRENT CHARACTERISTIC CURVES

For ..... Fuse Links. In .....

BASIS FOR DATA Standards ..... Dated .....

1. Tests made at ..... Volts a-c at ..... p.f., starting at 25C with no initial load.....
2. Curves are plotted to ..... Test points so variations should be .....

No. 12050-SK-IIB-1
Date 1-7-80 JJN
1-2-80 RLW

K-E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. MADE IN U.S.A. 46 5258

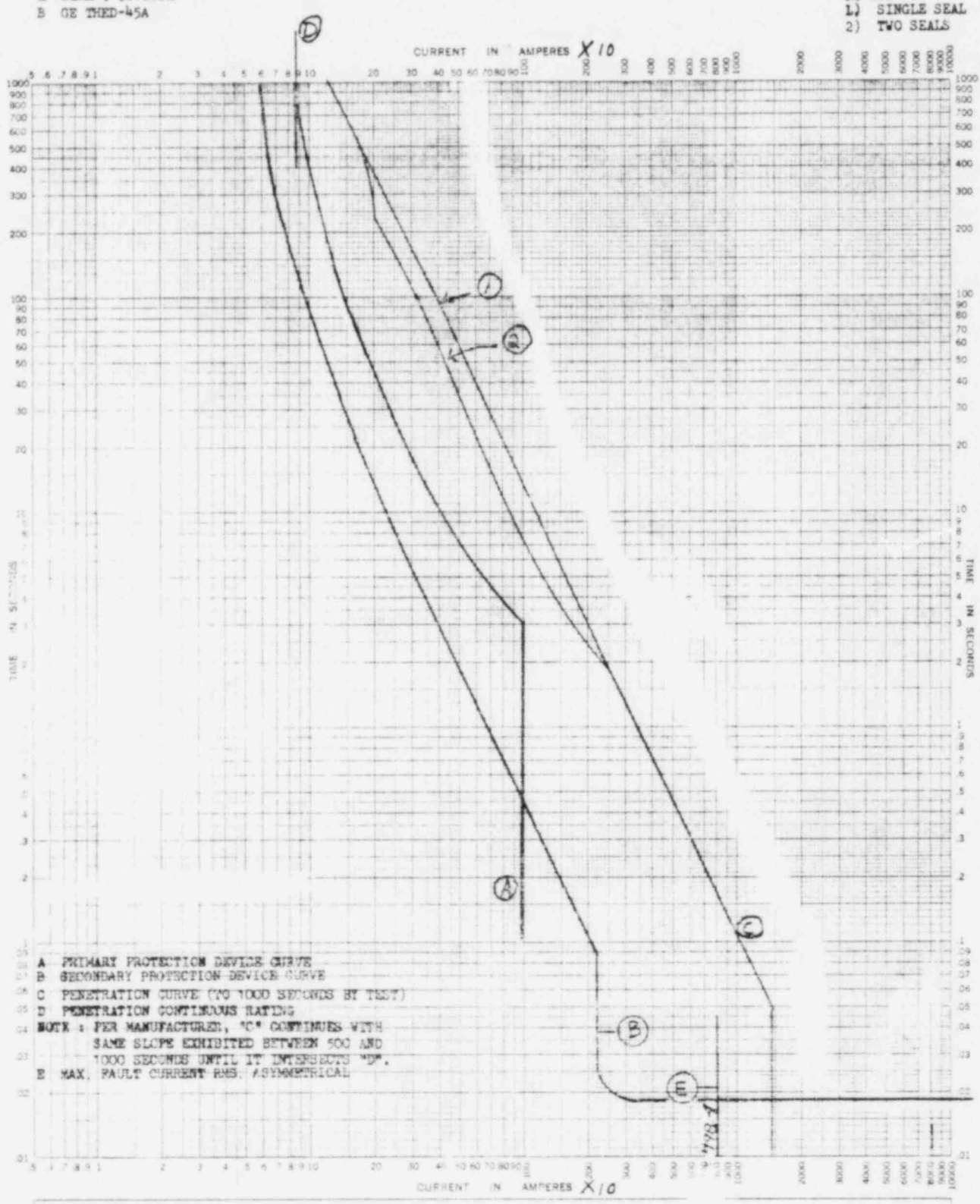
REV 1 JJN 2-7-80
RLW 2-8-80

PENETRATION TYPE IIB

RECEPT.

A NZMH-9 50-800A
B GE THED-45A

#4 AWG FT.
1) SINGLE SEAL
2) TWO SEALS



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links, In _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p-f. starting at 25C with no initial load.
2. Curves are plotted to _____ Test points so variations should be _____

No. 12050-3K-IIB-2
Date 1-7-80 SPH
1-7-80 RLW

REV 1 SPH 2-7-80
RLW 2-9-80

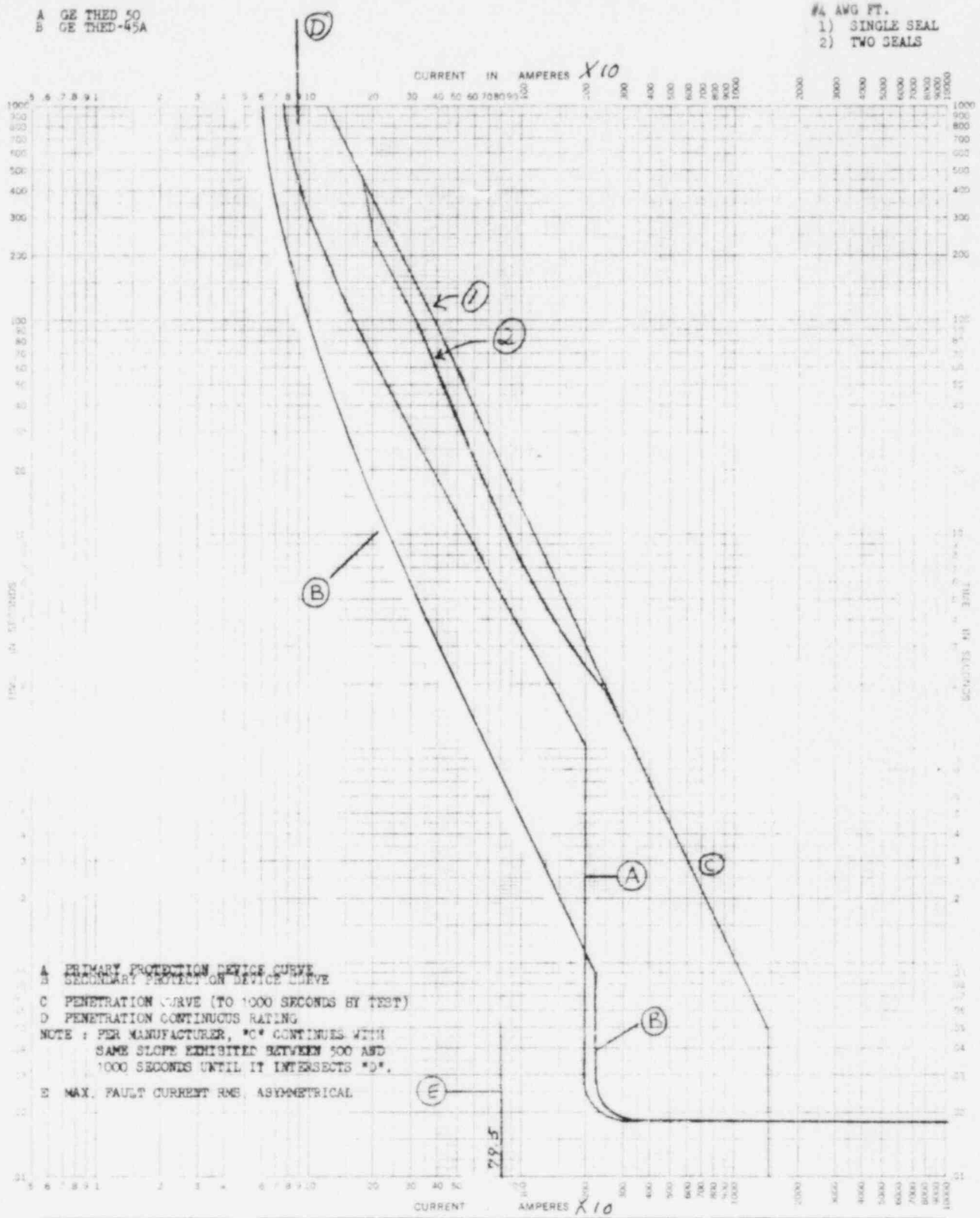
K-E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. MADE IN U.S.A. 48 5258

PENETRATION TYPE IIB

ELEVATOR

A GE THED 50
B GE THED-45A

#4 AWG FT.
1) SINGLE SEAL
2) TWO SEALS



A PRIMARY PROTECTION DEVICE CURVE
B SECONDARY PROTECTION DEVICE CURVE
C PENETRATION CURVE (TO 1000 SECONDS BY TEST)
D PENETRATION CONTINUOUS RATING
NOTE : PER MANUFACTURER, "C" CONTINUES WITH SAME SLOPE EXHIBITED BETWEEN 500 AND 1000 SECONDS UNTIL IT INTERSECTS "D".
E MAX. FAULT CURRENT RMS, ASYMMETRICAL

TIME-CURRENT CHARACTERISTIC CURVES

For ____ Fuse Links, In ____

BASIS FOR DATA Standards ____ Dated ____

1. Tests made at ____ Volts a-c at ____ p-f., starting at 25C with no initial load
2. Curves are plotted to ____ Test points so variations should be ____

No. 12050-3K-IIB-3
Date 1-7-80 JPN
1-7-80 RLW

REV 1 JPN 2-7-80
RLW 2-8-80

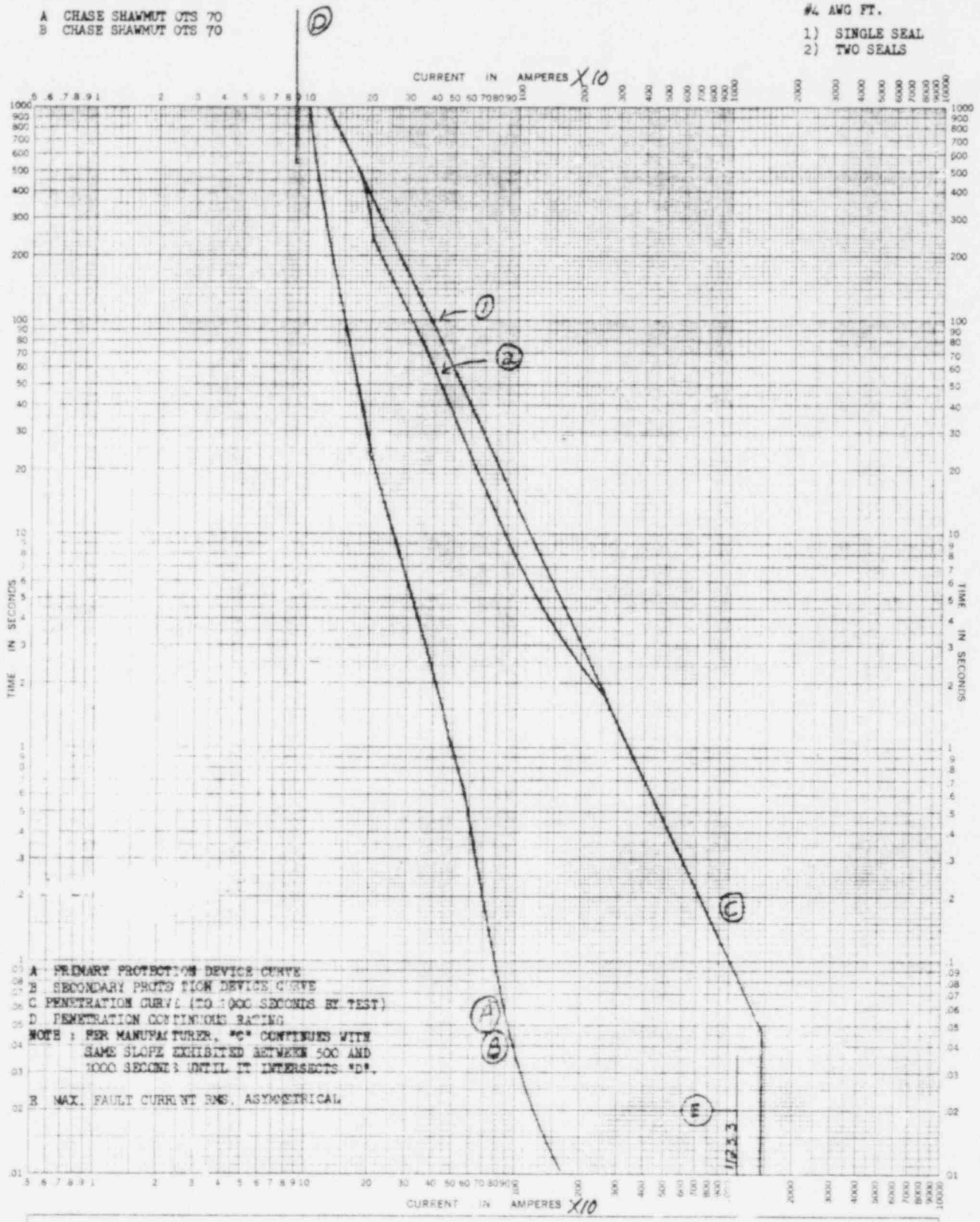
K-E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. MADE IN U.S.A. 48 3258

PENETRATION TYPE IIB - LTG PNL 4A-2

A CHASE SHAWMUT OTS 70
B CHASE SHAWMUT OTS 70

#4 AWG FT.

1) SINGLE SEAL
2) TWO SEALS



A PRIMARY PROTECTION DEVICE CURVE
B SECONDARY PROTECTION DEVICE CURVE
C PENETRATION CURVE (TO 1000 SECONDS BY TEST)
D PENETRATION CONTINUOUS RATING
NOTE : PER MANUFACTURER, "C" CONTINUES WITH SAME SLOPE EXHIBITED BETWEEN 500 AND 1000 SECONDS UNTIL IT INTERSECTS "D".

E MAX. FAULT CURRENT RMS. ASYMMETRICAL

TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links In _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p-f., starting at 25C with no initial load _____
2. Curves are plotted to _____ Test points so variations should be _____

No. 12050-SK-IIB-4
Date 1-7-80 REV 1 2-11-80

REV 1 JHW 2-7-80
JHB 2-11-80

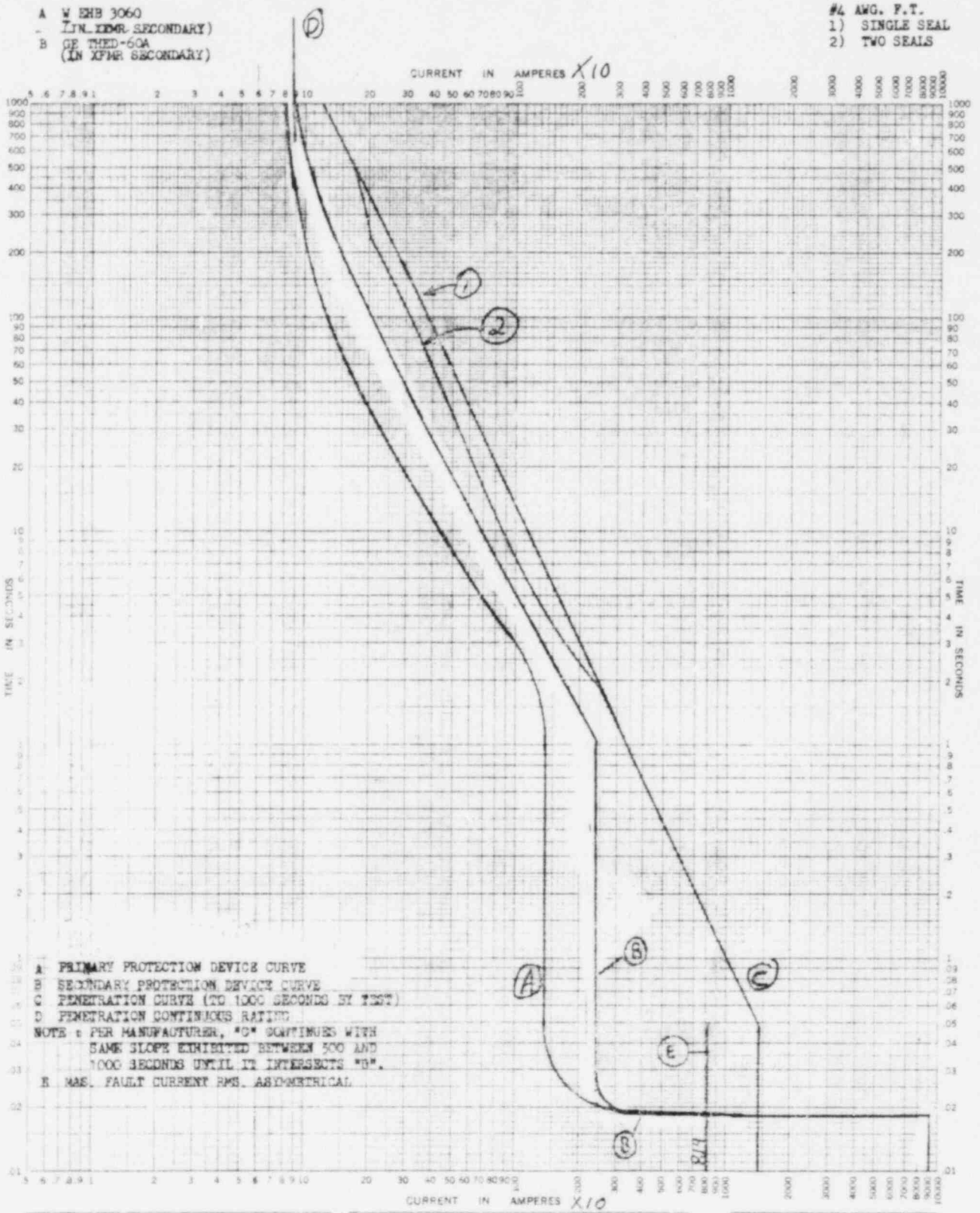
K•E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. 46 5258

PENETRATION TYPE IIB

PRESS. HTRS.
ST. GEN. SUPP. HTRS. A-1, B-1, A-2, B-2 & C-2

A W EHB 3060
~~_~~ 1200 (IN XFMR SECONDARY)
B GE THED-60A
(IN XFMR SECONDARY)

#4 AWG. F.T.
1) SINGLE SEAL
2) TWO SEALS



TIME-CURRENT CHARACTERISTIC CURVES

For ..... Fuse Links. In .....

BASIS FOR DATA Standards ..... Dated .....

1. Tests made at ..... Volts a-c at ..... p-f., starting at 25C with no initial load .....
2. Curves are plotted to ..... Test points so variations should be .....

No. 12050-SK-IIB-5

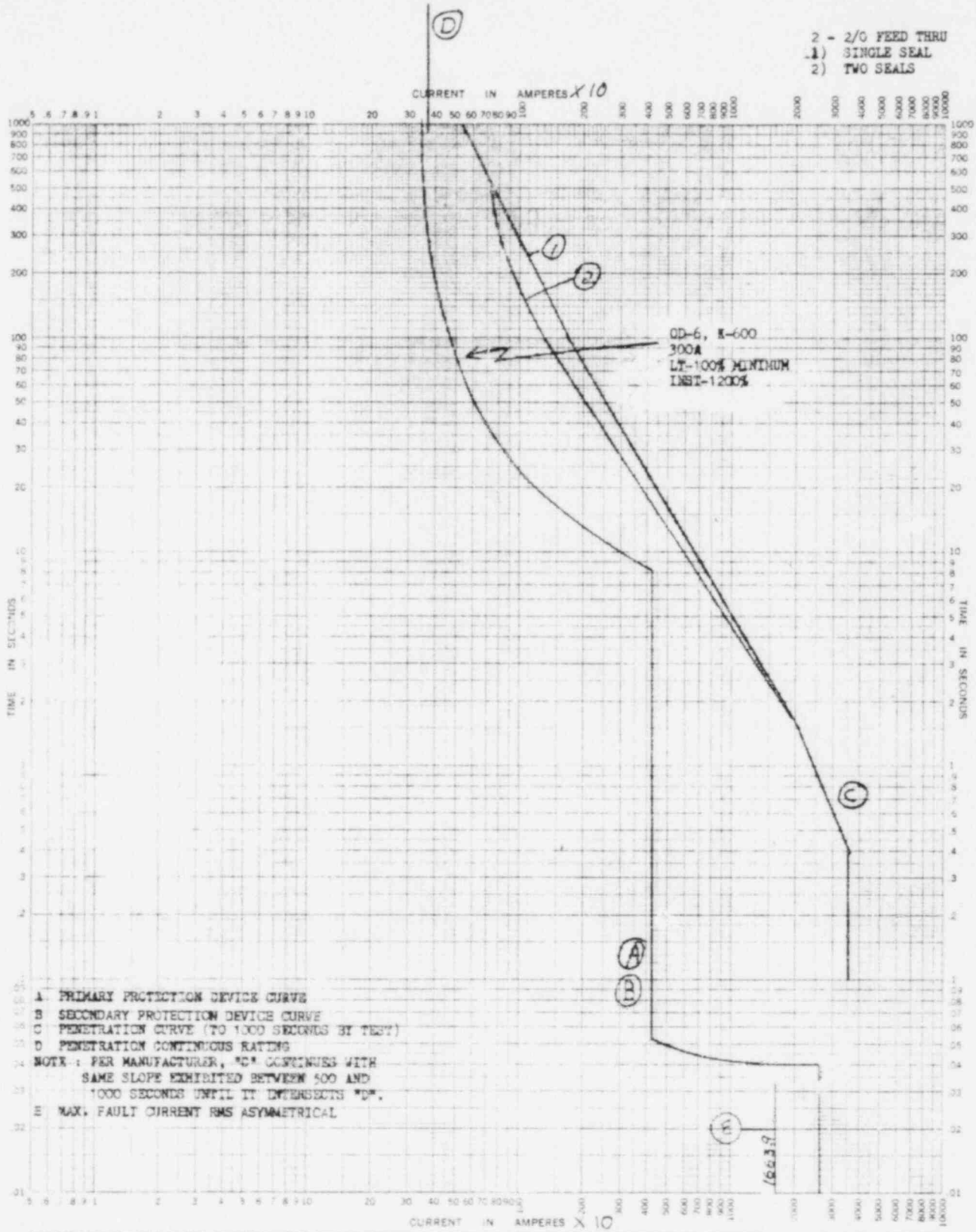
Date 1-7-80 MJW
1-7-80 RLW

REV 1 MJW 2-7-80
RLW 2-8-80

K+E TIME-CURRENT CHARACTERISTIC 46 5288
KEUFFEL & ESSER CO.

PENETRATION TYPE IIB

LTG PNL 19-2



TIME-CURRENT CHARACTERISTIC CURVES

For ..... Fuse Links, In .....

BASIS FOR DATA Standards ..... Dated .....

1. Tests made at ..... Volts a-c at ..... p-f., starting at 25C with no initial load .....
2. Curves are plotted to ..... Test points so variations should be .....

No. 12050-SK-IIC-1

Date 1-7-80 1-7-80

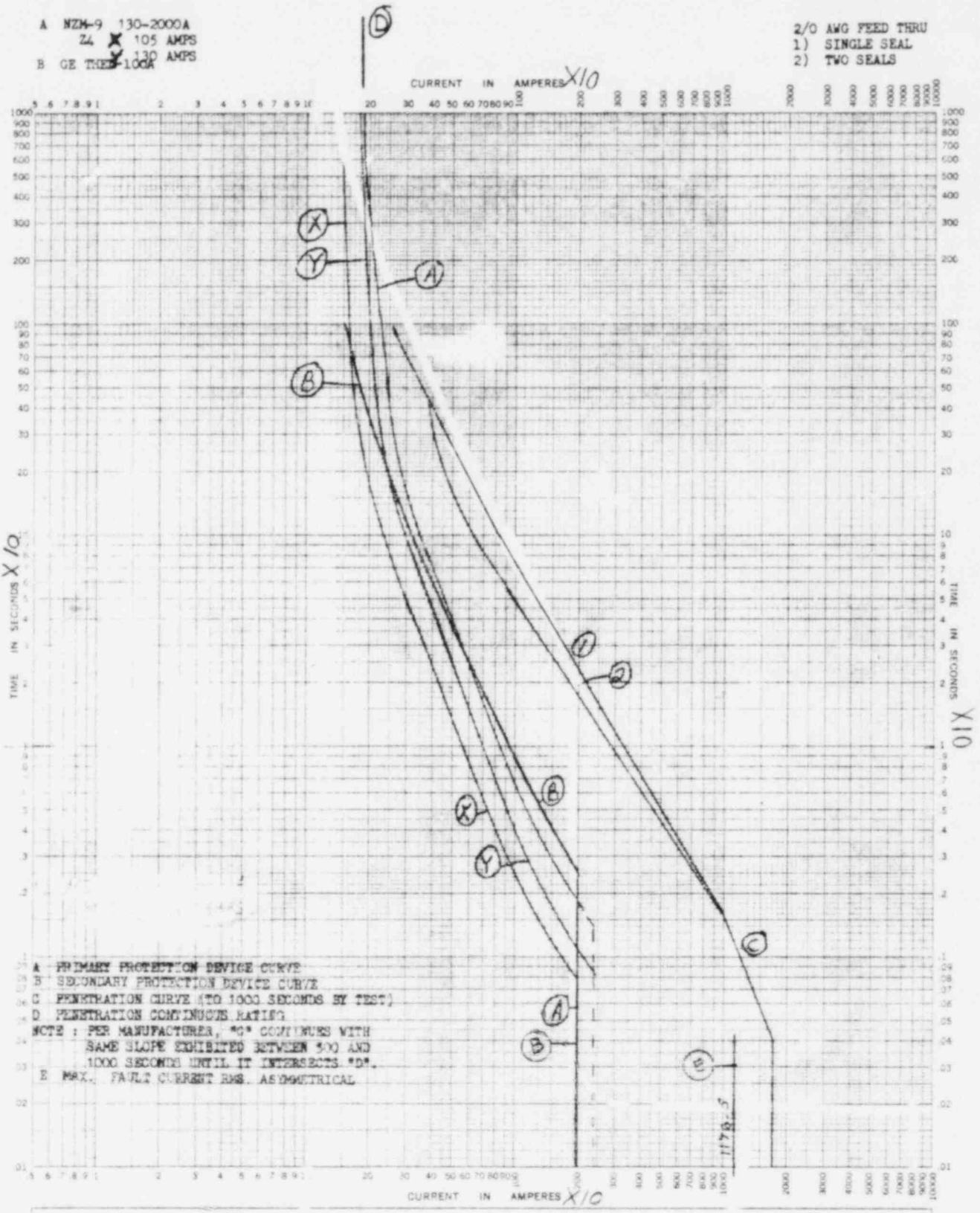
REV 1 BTW 2-7-80
JWB 2-8-80

K-E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. MADE IN U.S.A. 48 5258

PENETRATION TYPE IIC - 2-HV-F-01A, - B, - C

A NZM-9 130-2000A
Z4 X 105 AMPS
B GE THED X 100A 130 AMPS

2/0 AWG FEED THRU
1) SINGLE SEAL
2) TWO SEALS



A PRIMARY PROTECTION DEVICE CURVE
B SECONDARY PROTECTION DEVICE CURVE
C PENETRATION CURVE (TO 1000 SECONDS BY TEST)
D PENETRATION CONTINUOUS RATING
NOTE : PER MANUFACTURER, "C" CONTINUES WITH SAME SLOPE EXHIBITED BETWEEN 500 AND 1000 SECONDS UNTIL IT INTERSECTS "D".
E MAX. FAULT CURRENT RMS. ASYMMETRICAL

TIME-CURRENT CHARACTERISTIC CURVES

For ..... Fuse Links: In .....

BASIS FOR DATA Standards ..... Dated .....

1. Tests made at ..... Volts a-c at ..... p.f., starting at 25C with no initial load

2. Curves are plotted to ..... Test points so variations should be .....

No. 12050-SK-IIC-2
Date 1-7-80 MPN
1-7-80 RLW

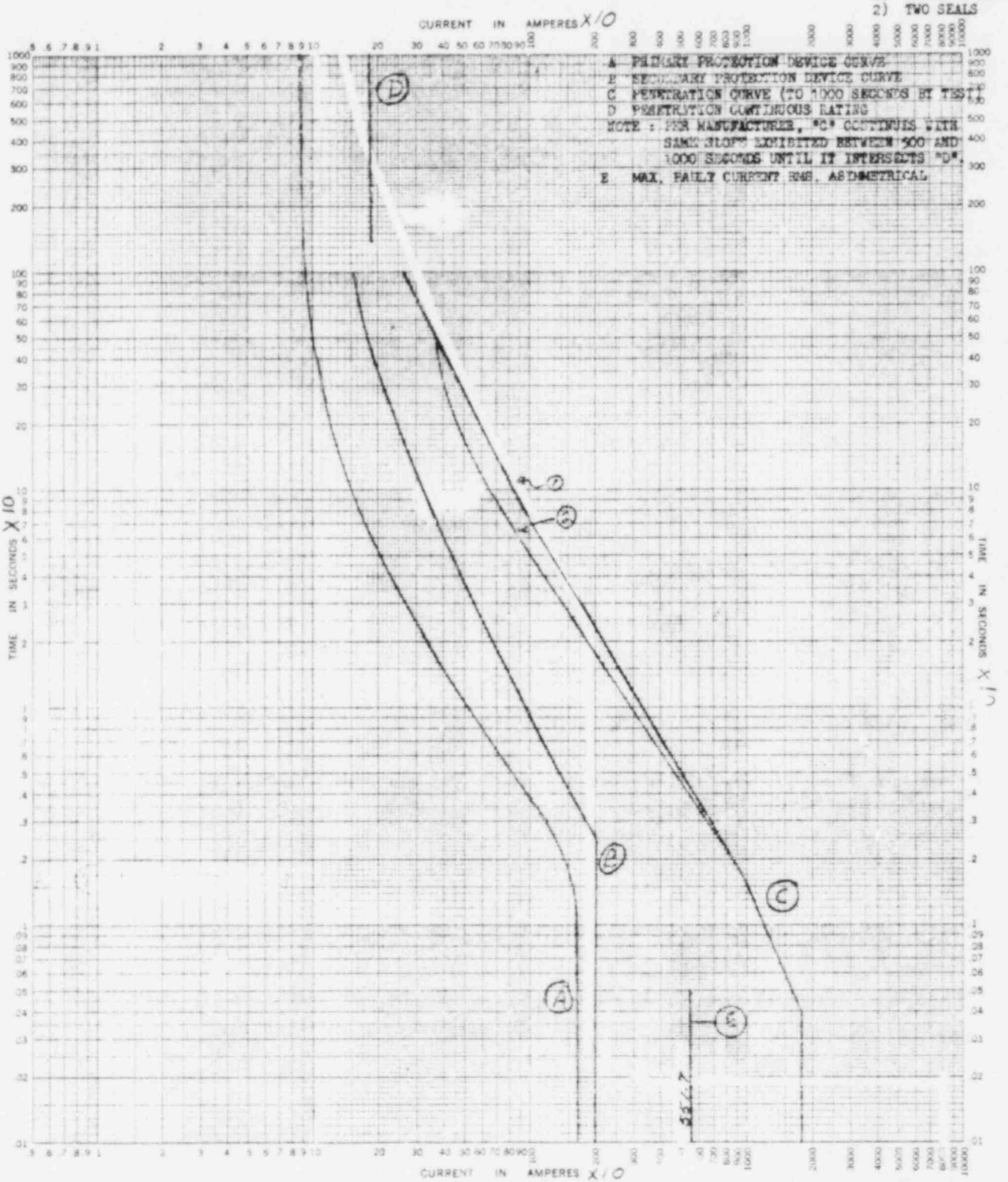
REV 1 MPN 2-7-80
RLW 2-8-80

K-E TIME-CURRENT CHARACTERISTIC 48 5258
KEUFFEL & ESSER CO. MADE IN U.S.A.

PENETRATION TYPE IIC - 2-HV-F-37 SERIES

A W EHB-3070 70A
B GE THED-100A

2/0 FEED THRU
1) SINGLE SEAL
2) TWO SEALS



TIME-CURRENT CHARACTERISTIC CURVES

For ____ Fuse Links: In ____

BASIS FOR DATA Standards ____ Dated ____

1. Tests made at ____ Volts a-c at ____ p.f., starting at 25C with no initial load.
2. Curves are plotted to ____ Test points so variations should be ____

N. 12050-SK-IIC-3
Date 1-7-80 MPN
1-7-80 RLW

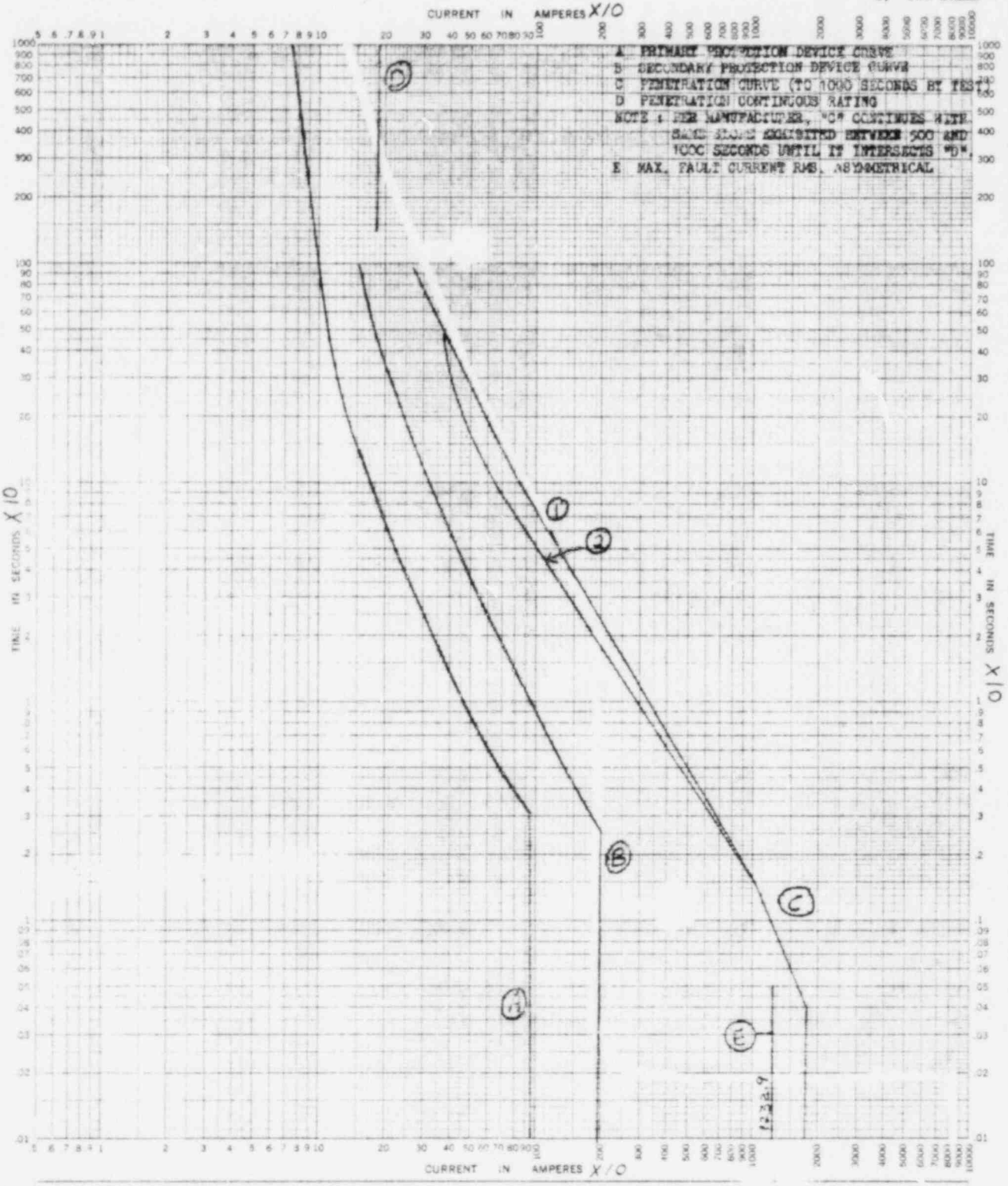
REV 1 MPN 2-7-80
RLW 2-8-80

K+E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. MADE IN U.S.A. 46 5258

PENETRATION TYPE IIC - ST. GEN SUPP. HTRS. C-1, A-3, B-3 & C-3

A NZMH-9 60-800A
B GE THED-100A

2/0 FEED THRU
1) SINGLE SEAL
2) TWO SEALS



TIME-CURRENT CHARACTERISTIC CURVES

For ____ Fuse Links. In ____

BASIS FOR DATA Standards ____ Dated ____

1. Tests made at ____ Volts a-c at ____ p-f., starting at 25C with no initial load

2. Curves are plotted to ____ Test points so variations should be ____

No. 12050-SK-IIC-A
Date 1-7-80 MW
1-2-80 RLW

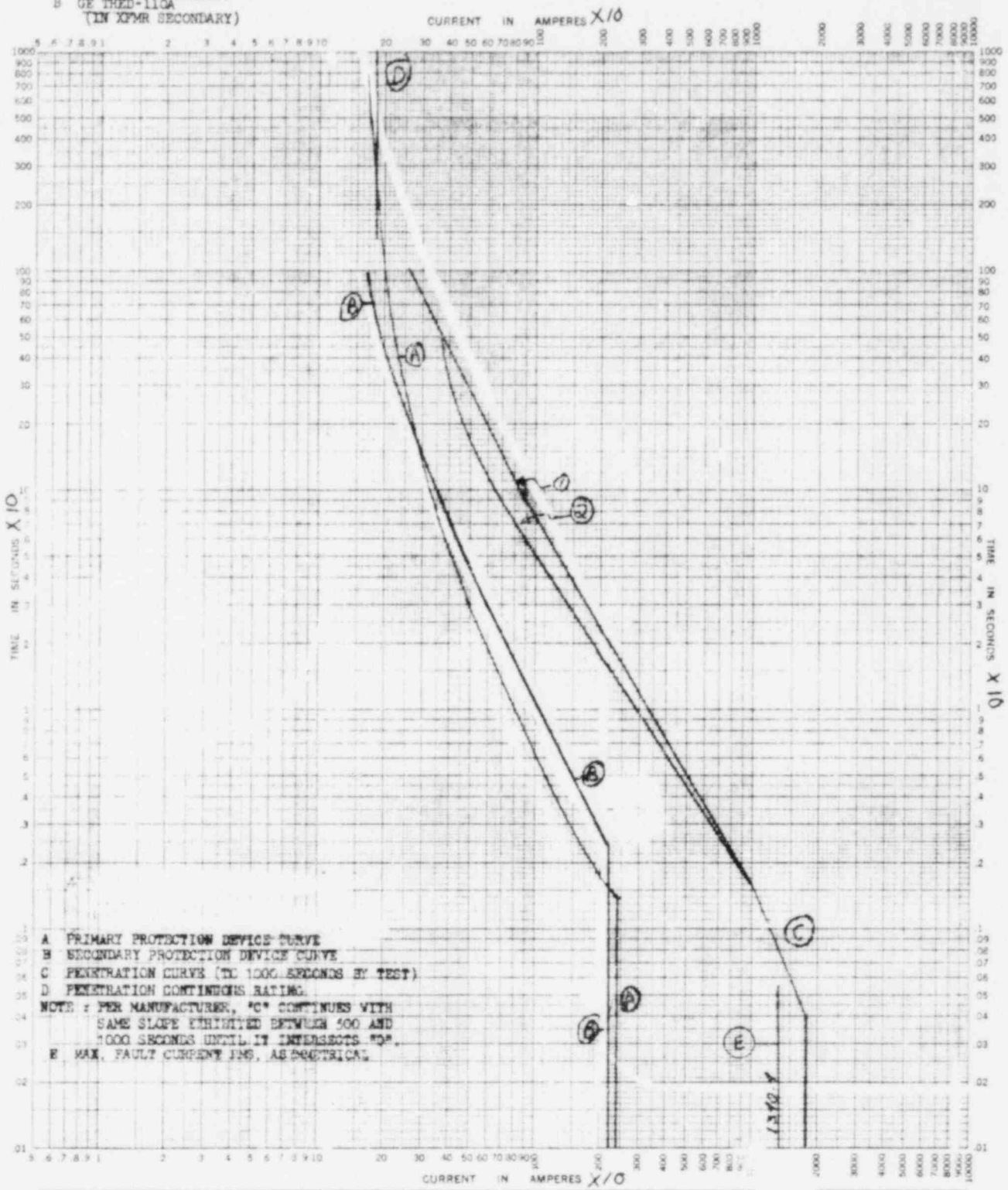
REV 1 MW 2-7-80
RLW 2-8-80

K-E TIME-CURRENT CHARACTERISTIC 48 5258
KEUFFEL & ESSER CO

PENETRATION TYPE IIC - RECEPT LOOPS

A NZMH-9 160-2900A
(SET @ 140)
(IN XFMR SECONDARY)
B GE THED-113A
(IN XFMR SECONDARY)

2/0 FEED THRU
1) SINGLE SEAL
2) TWO SEALS



A PRIMARY PROTECTION DEVICE CURVE
B SECONDARY PROTECTION DEVICE CURVE
C PENETRATION CURVE (TO 1000 SECONDS BY TEST)
D PENETRATION CONTINUOUS RATING.
NOTE : PER MANUFACTURER, "C" CONTINUES WITH SAME SLOPE EXHIBITED BETWEEN 500 AND 1000 SECONDS UNTIL IT INTERSECTS "D".
E MAX. FAULT CURRENT RMS, ASYMETRICAL

TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links. In _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p-f., starting at 25C with no initial load _____
2. Curves are plotted to _____ Test points so variations should be _____

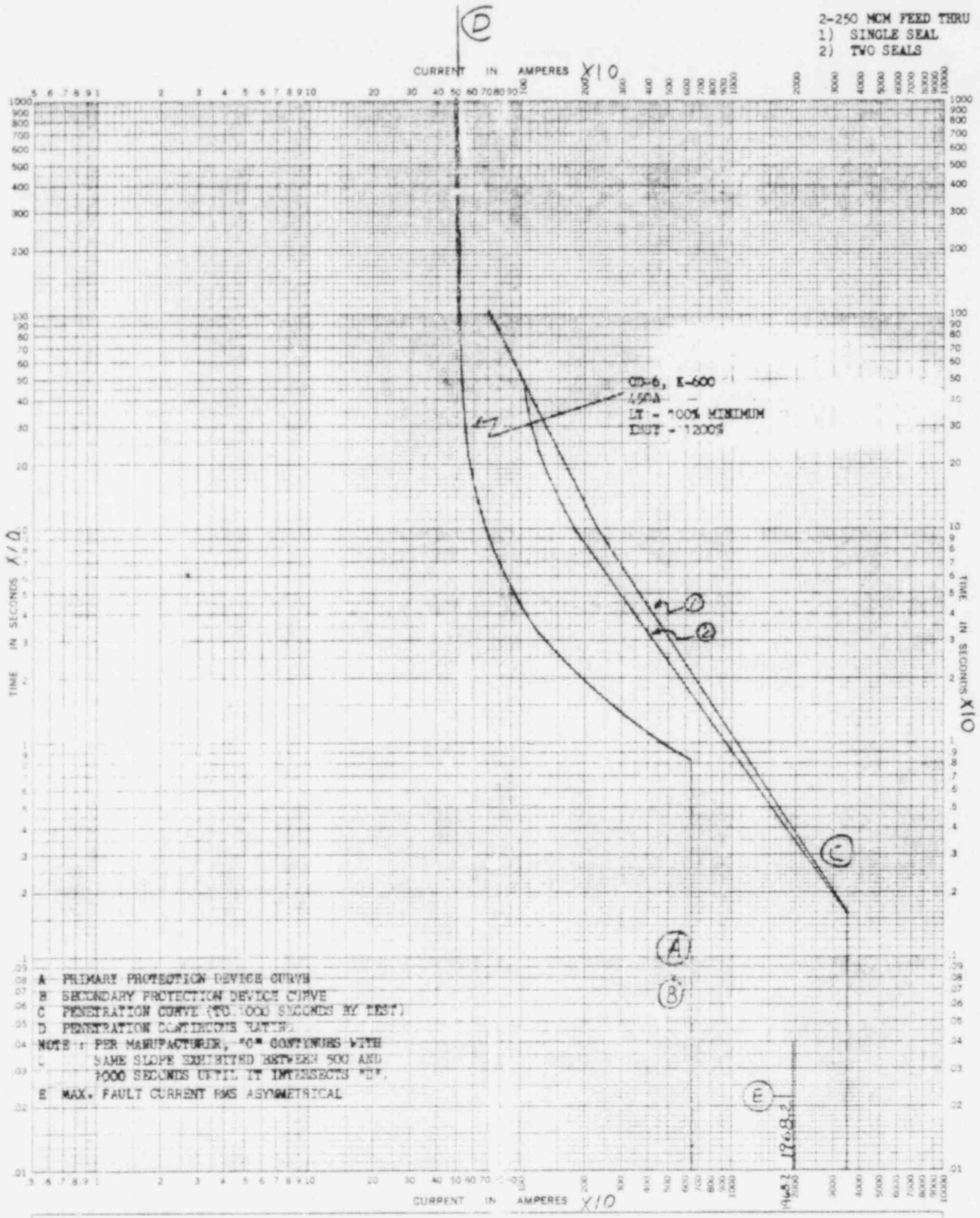
No. 12050-SK-IIC-5
Date 1-7-80 YPN
1-2-80 RLW

REV 1 YPN 2-7-30
RLW 2-8-80

K-E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. 46 5258

PENETRATION TYPE IIC

LTG PNLS 21-2, 18-2 & 22-2



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links. In _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p.f. starting at 25C with no initial load

2. Curves are plotted to _____ Test points so variations should be _____

No. 12050-3X-IID-1

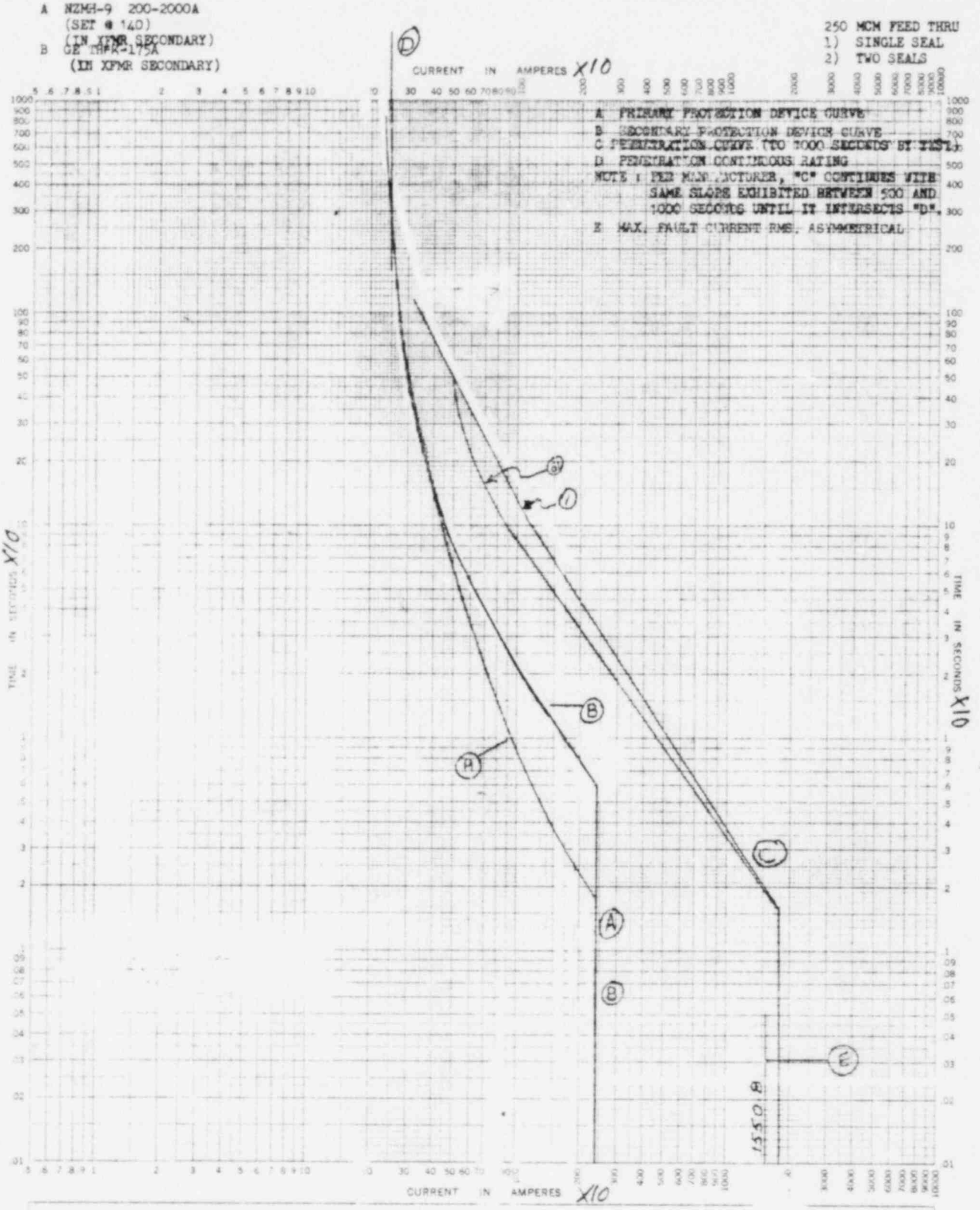
Date 1-7-80 JHN
1-7-80 JAB

REV 1 JHN 2-7-80
JAB 2-8-80

K-E TIME-CURRENT CHARACTERISTIC KEUFFEL & ESSER CO. NEW YORK 48 5258

PENETRATION TYPE IID

2-RS-P-C1A, & B



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links. In _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p-f., starting at 25C with no initial load.
2. Curves are plotted to _____ Test points so variations should be _____

No. 12050-SK-IID-2

Date 1-7-80 JJW
1-7-80

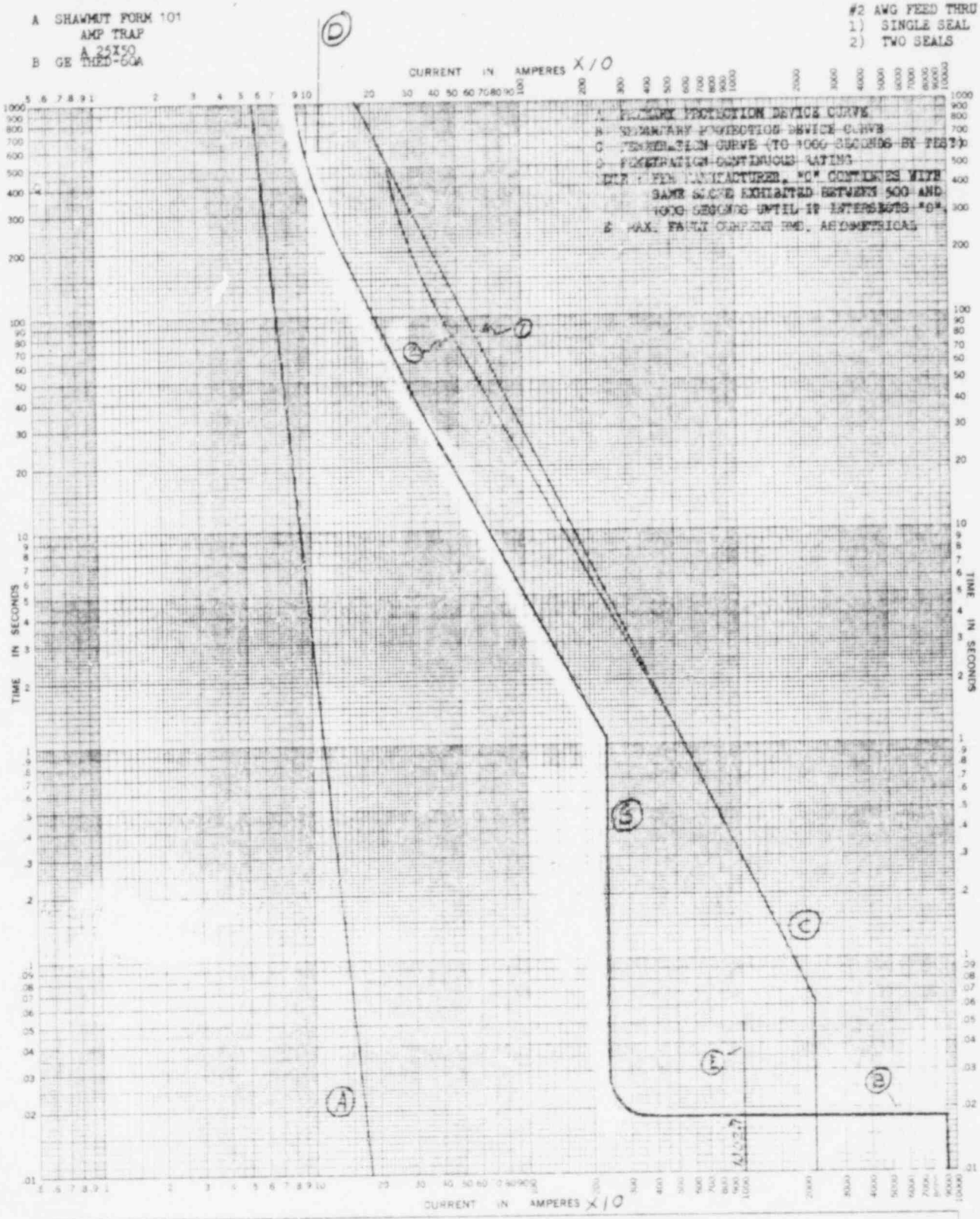
K-E TIME-CURRENT CHARACTERISTIC 48 5258
KEUFFEL & ESSER CO. NEW YORK

REV 1 JJW 2-7-80
RLW 2-8-80

PENETRATION TYPE IID - LTG PNL 16-2

A SHAWMUT FORM 101
AMP TRAP
A 25X50
B GE TMED-60A

#2 AWG FEED THRU
1) SINGLE SEAL
2) TWO SEALS



TIME-CURRENT CHARACTERISTIC CURVES

For _____ Fuse Links, In _____

BASIS FOR DATA Standards _____ Dated _____

1. Tests made at _____ Volts a-c at _____ p.f. starting at 25C with no initial load

2. Curves are plotted to _____ Test points so variations should be _____

No. 12050-3K-IIE-1

Date 1-7-80 JPN
1-2-80 JPN

REV 1 JPN 2-7-80
RLW 2-8-80

K-Σ TIME-CURRENT CHARACTERISTIC 48 5258
KEUFFEL & ESSER CO.

PENETRATION TYPE IIE - FULL LENGTH RODS - LIFTERS